



Introduction to R, RStudio, & R packages

W. Evan Johnson, Ph.D.
Professor, Division of Infectious Disease
Director, Center for Data Science
Rutgers University – New Jersey Medical School
w.evan.johnson@rutgers.edu

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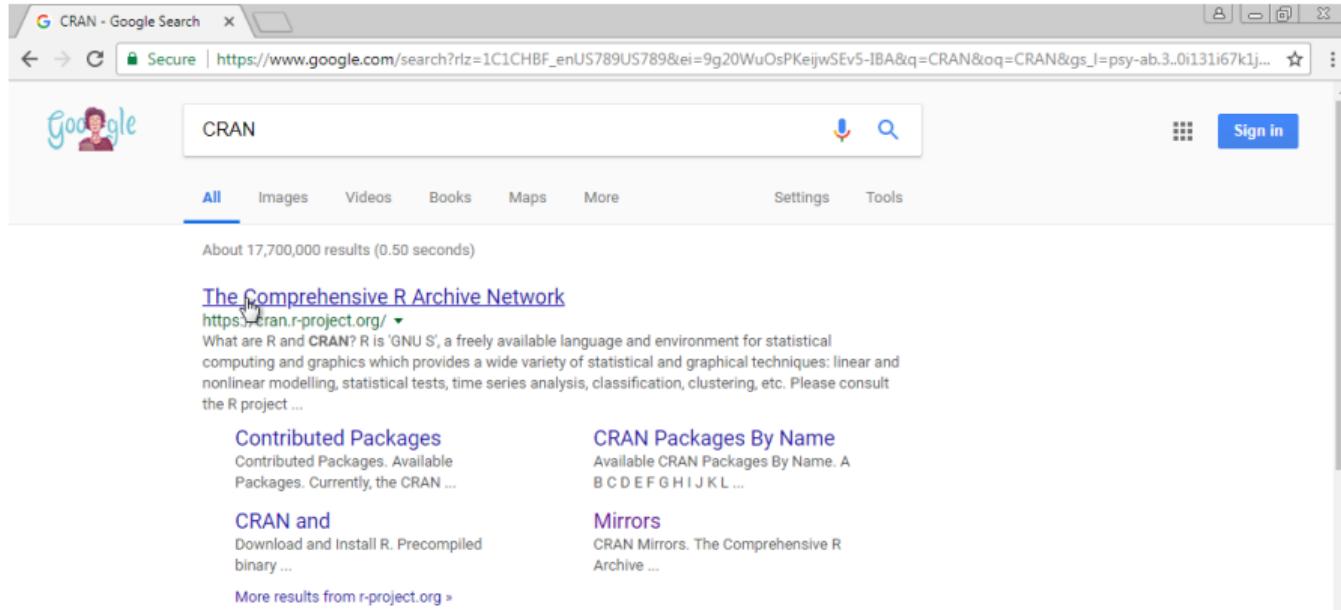
Installing R and RStudio

R is a language for statistical computing and graphics. **RStudio** is an interactive desktop environment (IDE), but it is not R, nor does it include R when you download and install it. Therefore, to use RStudio, we first need to install R.



Installing R (Windows and Mac)

Download R from the Comprehensive R Archive Network (CRAN):
<https://cran.r-project.org/>. Search for “CRAN” on your browser:



The screenshot shows a Google search results page for "CRAN". The search bar at the top contains "CRAN". Below the search bar, there are tabs for "All", "Images", "Videos", "Books", "Maps", and "More". The "All" tab is selected. The search results indicate "About 17,700,000 results (0.50 seconds)". The first result is a link to "The Comprehensive R Archive Network" (<https://cran.r-project.org/>). The snippet for this result describes R as a freely available language and environment for statistical computing and graphics, mentioning its wide variety of statistical and graphical techniques. Below the snippet, there are sections for "Contributed Packages", "CRAN Packages By Name", "CRAN and", and "Mirrors". At the bottom of the page, there is a footer with the R logo and the text "Center for Data Science".

Google

CRAN

All Images Videos Books Maps More Settings Tools

About 17,700,000 results (0.50 seconds)

[The Comprehensive R Archive Network](https://cran.r-project.org/)
https://cran.r-project.org/

What are R and CRAN? R is 'GNU S', a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modelling, statistical tests, time series analysis, classification, clustering, etc. Please consult the R project ...

Contributed Packages
Contributed Packages. Available Packages. Currently, the CRAN ...

CRAN Packages By Name
Available CRAN Packages By Name. A B C D E F G H I J K L ...

CRAN and
Download and Install R. Precompiled binary ...

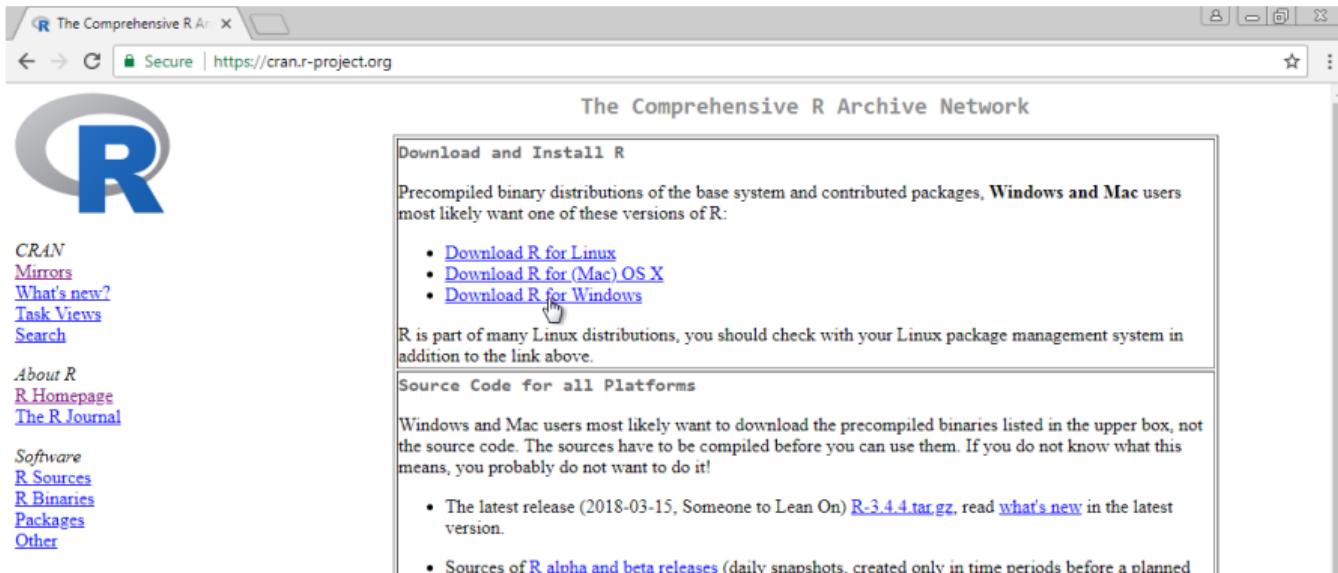
Mirrors
CRAN Mirrors. The Comprehensive R Archive ...

More results from r-project.org »

R Center for Data Science

Installing (Windows and Mac)

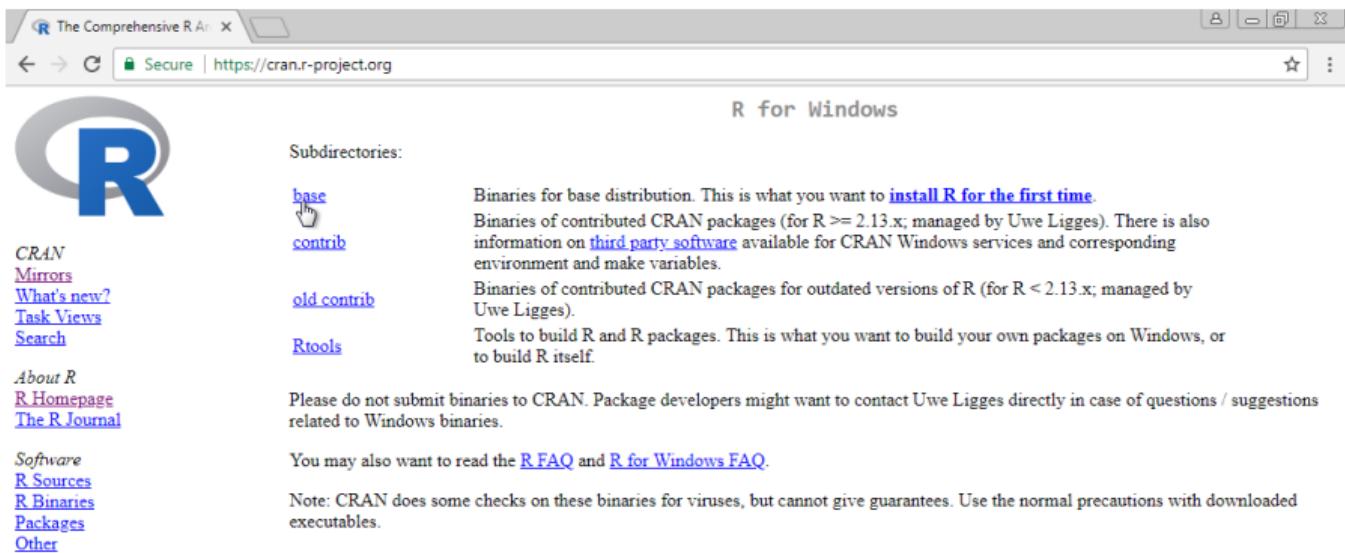
Once on the CRAN page, select the version for your operating system: Linux, Mac OS X, or Windows. Here we show screenshots for Windows, but the process is similar for the other platforms. When they differ, we will also show screenshots for Mac OS X.



The screenshot shows a web browser displaying the CRAN website (<https://cran.r-project.org>). The main navigation bar includes links for 'CRAN', 'Mirrors', 'What's new?', 'Task Views', 'Search', 'About R', 'R Homepage', and 'The R Journal'. On the left, there is a large blue 'R' logo. The central content area is titled 'The Comprehensive R Archive Network' and features a heading 'Download and Install R'. It states: 'Precompiled binary distributions of the base system and contributed packages. Windows and Mac users most likely want one of these versions of R:' followed by a bulleted list: 'Download R for Linux', 'Download R for (Mac) OS X', and 'Download R for Windows'. Below this, a note says: 'R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.' Another section titled 'Source Code for all Platforms' notes: 'Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!' A bulleted list at the bottom provides instructions for the latest release: 'The latest release (2018-03-15, Someone to Lean On) [R-3.4.4.tar.gz](#), read [what's new](#) in the latest version.' and 'Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned

Installing R (Windows)

Once at the CRAN download page, you will have several choices. You want to install the *base* subdirectory. This installs the basic packages you need to get started. We will later learn how to install other needed packages from within R.



The Comprehensive R Archive Network (CRAN) download page for Windows. The page title is "R for Windows".

Subdirectories:

- [base](#) Binaries for base distribution. This is what you want to [install R for the first time](#).
- [contrib](#) Binaries of contributed CRAN packages (for R >= 2.13.x; managed by Uwe Ligges). There is also information on [third party software](#) available for CRAN Windows services and corresponding environment and make variables.
- [old_contrib](#) Binaries of contributed CRAN packages for outdated versions of R (for R < 2.13.x; managed by Uwe Ligges).
- [Rtools](#) Tools to build R and R packages. This is what you want to build your own packages on Windows, or to build R itself.

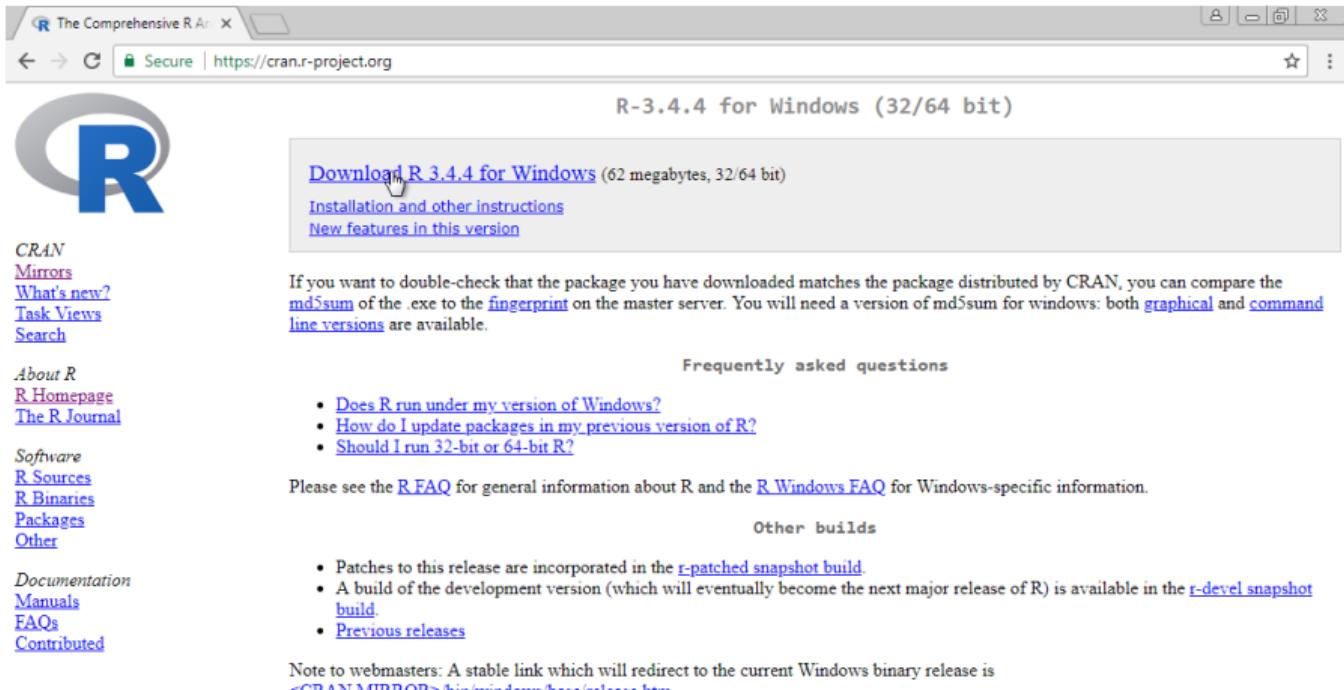
Please do not submit binaries to CRAN. Package developers might want to contact Uwe Ligges directly in case of questions / suggestions related to Windows binaries.

You may also want to read the [R FAQ](#) and [R for Windows FAQ](#).

Note: CRAN does some checks on these binaries for viruses, but cannot give guarantees. Use the normal precautions with downloaded executables.

Installing R (Windows)

Click on the link for the latest version to start the download.



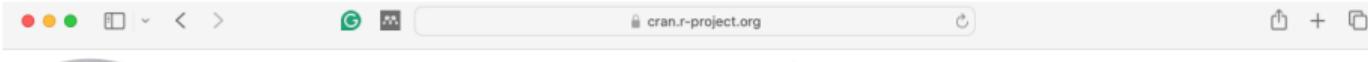
The screenshot shows a web browser window with the URL <https://cran.r-project.org>. The page displays the R logo and navigation links for CRAN Mirrors, What's new?, Task Views, Search, About R, R Homepage, The R Journal, Software (R Sources, R Binaries, Packages, Other), Documentation (Manuals, FAQs, Contributed), Frequently asked questions, Other builds, and a note for webmasters. The main content area highlights the "R-3.4.4 for Windows (32/64 bit)" section, which includes a large blue "Download R 3.4.4 for Windows" button, a link to "Installation and other instructions", and a link to "New features in this version". Below this, there is a note about double-checking the package download using md5sum and fingerprint. The "Frequently asked questions" section lists three items: "Does R run under my version of Windows?", "How do I update packages in my previous version of R?", and "Should I run 32-bit or 64-bit R?". The "Other builds" section lists three items: "Patches to this release are incorporated in the r-patched snapshot build.", "A build of the development version (which will eventually become the next major release of R) is available in the r-devel snapshot build.", and "Previous releases". At the bottom, a note for webmasters states: "Note to webmasters: A stable link which will redirect to the current Windows binary release is <CRAN.MIRROR>/bin/windows/contrib/3.4/binaries/".

Installing R (Windows)

Once the installer file downloads, you can click on that tab to start the installation process. Some browsers may display this differently, so you will have to find where they store downloaded files and click on them to get the process started.

Installing R (Mac)

If using Safari on a Mac, things may look a little different:



The screenshot shows a Mac OS X-style browser window with a tab bar at the top. The address bar contains the URL cran.r-project.org. The main content area displays the "R for macOS" page from CRAN. On the left, there's a large "CRAN" logo with a blue "R" inside a grey circle, and a sidebar with links like "CRAN Mirrors", "What's new?", "Search", and "CRAN Team". The main text on the page discusses binary distributions for macOS, noting that versions older than 4.0.0 are available from the CRAN archive. It also includes a note about taking precautions with downloaded executables and instructions for checking package integrity using "pkgutil --check-signature". Below this, there's a section for the latest release (R 4.4.2) and specific sections for Apple silicon and older Intel Macs.

R for macOS

This directory contains binaries for the base distribution and of R and packages to run on macOS. R and package binaries for R versions older than 4.0.0 are only available from the [CRAN archive](#) so users of such versions should adjust the CRAN mirror setting (<https://cran-archive.r-project.org>) accordingly.

Note: Although we take precautions when assembling binaries, please use the normal precautions with downloaded executables.

R 4.4.2 "Pile of Leaves" released on 2024/10/31

Please check the integrity of the downloaded package by checking the signature:
`pkgutil --check-signature R-4.4.2-arm64.pkg`
in the *Terminal* application. If Apple tools are not available you can check the SHA1 checksum of the downloaded image:
`openssl sha1 R-4.4.2-arm64.pkg`

Latest release:

For Apple silicon (M1,..) Macs: [R-4.4.2-arm64.pkg](#)
SHA1:
hash: 7832cb5d6cd686fd3cc54c8ab4c93c464540a944
(ca. 94MB, notarized and signed)

For older Intel Macs: [R-4.4.2-x86_64.pkg](#)
SHA1:
hash: f49ad56ce3a0fc569fd8f9668749bc861b965b5e
(ca. 96MB, notarized and signed)

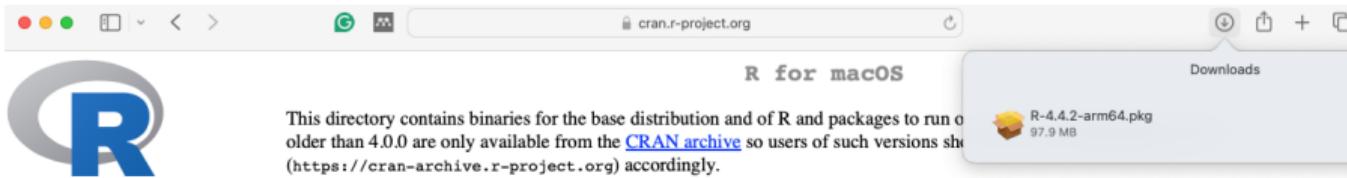
macOS Ventura users: there is a known bug in Ventura preventing installations from some locations without a prompt. If the installation fails, move the downloaded file away from the *Downloads* folder (e.g., to your home or Desktop).

Documentation
[Manuals](#)
[FAQs](#)
[Contributed](#)

 Center for Data Science

Installing R (Mac)

If using Safari on a Mac, you can access the download through the download button.



[CRAN
Mirrors](#)
[What's new?](#)
[Search](#)
[CRAN Team](#)

[About R](#)
[R Homepage](#)
[The R Journal](#)

[Software](#)
[R Sources](#)
[R Binaries](#)
[Packages](#)
[Task Views](#)
[Other](#)

[Documentation](#)
[Manuals](#)
[FAQs](#)
[Contributed](#)

This directory contains binaries for the base distribution and of R and packages to run on older than 4.0.0 are only available from the [CRAN archive](#) so users of such versions should (<https://cran-archive.r-project.org>) accordingly.

Note: Although we take precautions when assembling binaries, please use the normal precautions with downloaded executables.

R 4.4.2 "Pile of Leaves" released on 2024/10/31

Please check the integrity of the downloaded package by checking the signature:

`pkutil --check-signature R-4.4.2-arm64.pkg`

in the *Terminal* application. If Apple tools are not available you can check the SHA1 checksum of the downloaded image:
`openssl sha1 R-4.4.2-arm64.pkg`

Latest release:

For Apple silicon (M1,2,...) Macs:

[R-4.4.2-arm64.pkg](#)

SHA1:
hash: 7832eh5d6cd686fd3cc54c8ab4c93c464540a944
(ca. 94MB, notarized and signed)

R 4.4.2 binary for macOS 11 (**Big Sur**) and higher, signed and notarized packages.

Contains R 4.4.2 framework, R.app GUI 1.81, Tcl/Tk 8.6.12 X11 libraries and Texinfo 6.8. The latter two components are optional and can be omitted when choosing "custom install", they are only needed if you want to use the `tcltk` R package or build package documentation from sources.

For older Intel Macs:

[R-4.4.2-x86_64.pkg](#)

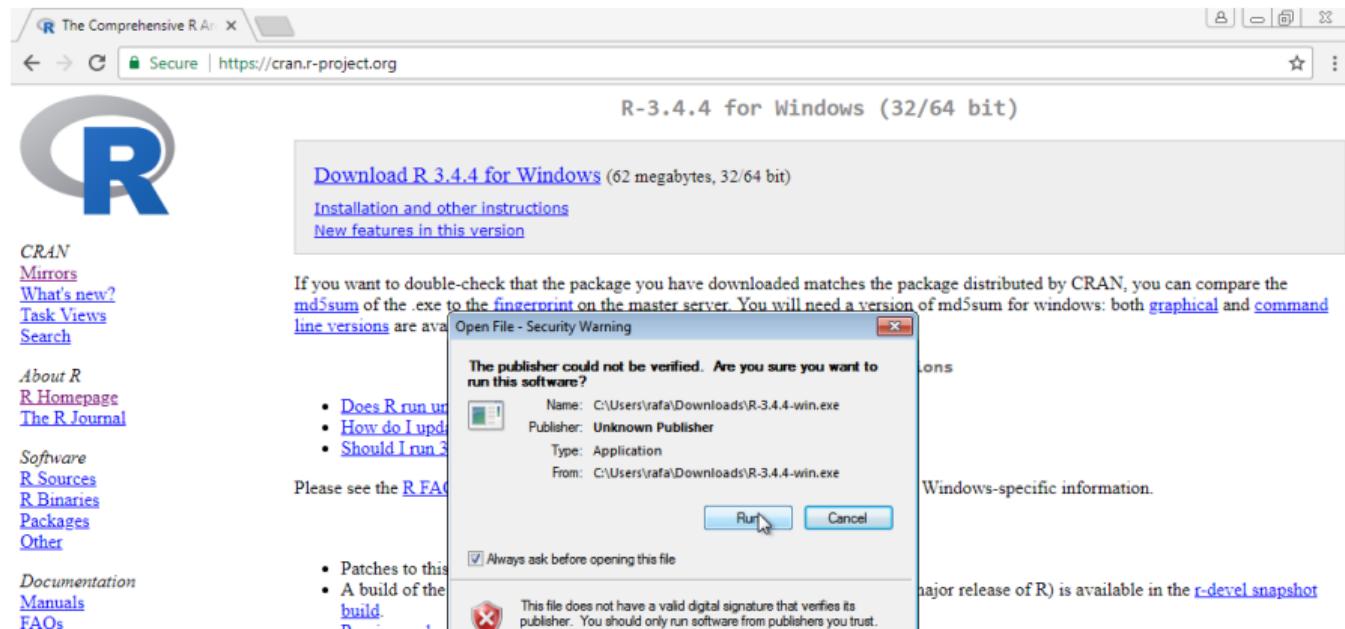
SHA1:
hash: f49ad56ce3a0fuc5691df09668749bc861b965b5e
(ca. 96MB, notarized and signed)

macOS Ventura users: there is a known bug in Ventura preventing installations from some locations without a prompt. If the installation fails, move the downloaded file away from the *Downloads* folder (e.g., to your home or Desktop).

Note: the use of X11 (including `tcltk`) requires `XQuartz` (version 2.8.5 or later).

Installing R (Windows)

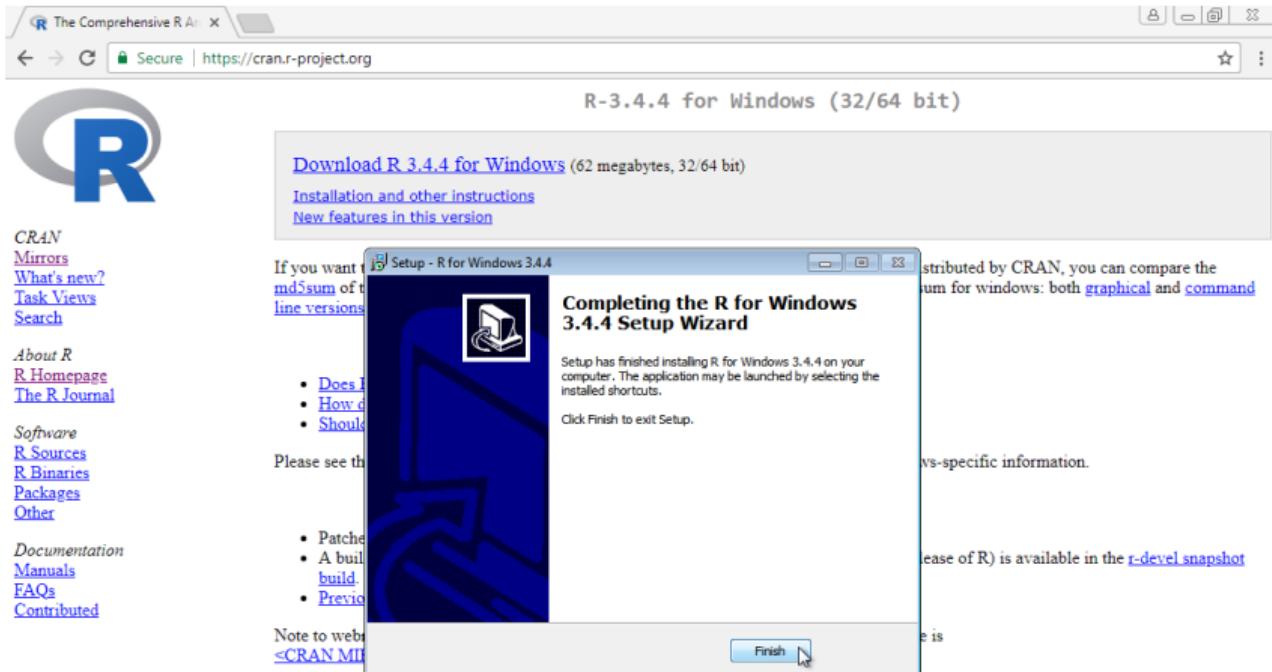
You can now click through different choices to finish the installation. We recommend you select all the default choices.



The screenshot shows the CRAN website for R 3.4.4 for Windows (32/64 bit). On the left, there's a large R logo and a sidebar with links like CRAN, Mirrors, What's new?, Task Views, Search, About R, R Homepage, The R Journal, Software, R Sources, R Binaries, Packages, Other, Documentation, Manuals, and FAQs. The main content area has a heading "Download R 3.4.4 for Windows (62 megabytes, 32/64 bit)" with links for Installation and other instructions and New features in this version. Below this, there's a note about verifying the download using md5sum and fingerprint. A Windows security dialog box titled "Open File - Security Warning" is overlaid on the page, asking if the user wants to run the software from an unknown publisher. The dialog shows the file path C:\Users\rafa\Downloads\R-3.4.4-win.exe, the publisher as Unknown Publisher, and the type as Application. It also shows the file was downloaded from C:\Users\rafa\Downloads\R-3.4.4-win.exe. At the bottom of the dialog, there are "Run" and "Cancel" buttons, and a checked checkbox for "Always ask before opening this file". A red warning icon is visible at the bottom of the dialog.

Installing R (Windows)

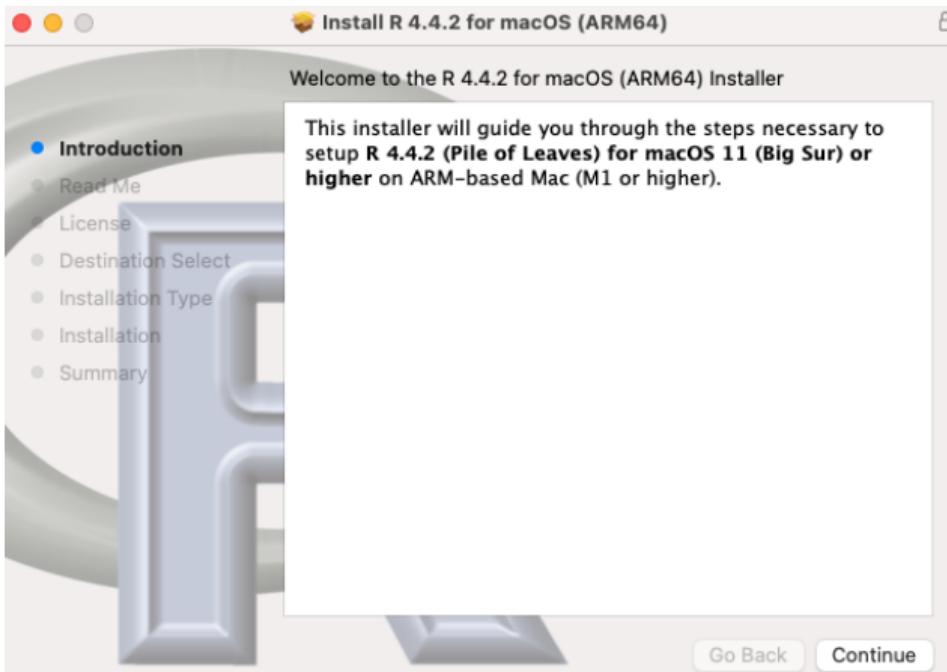
Continue to select all the defaults until you have completed the setup:



The screenshot shows two windows side-by-side. On the left is a web browser displaying the CRAN mirror page for R 3.4.4 for Windows. It features the R logo, links for 'Download R 3.4.4 for Windows' (62 megabytes, 32/64 bit), 'Installation and other instructions', and 'New features in this version'. On the right is the 'Setup - R for Windows 3.4.4' window titled 'Completing the R for Windows 3.4.4 Setup Wizard'. It displays a message stating that setup has finished installing R for Windows 3.4.4, and provides links for 'Does it work?', 'How do I...', 'Should I...', 'Patches', 'A build', 'build', and 'Previous versions'. At the bottom is a 'Finish' button.

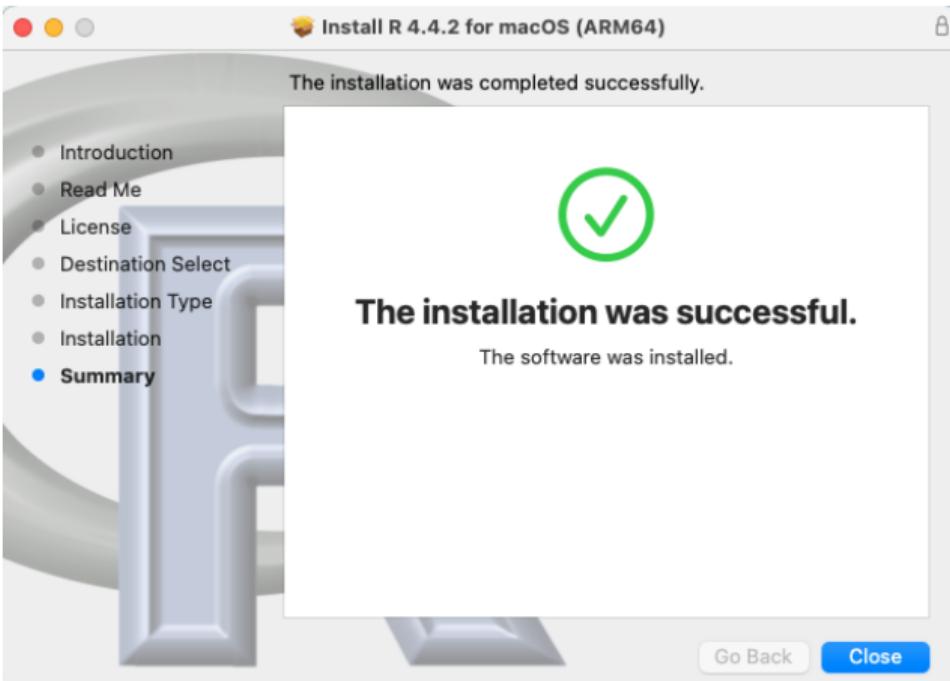
Installing R (Mac)

On the Mac it looks different, but you are again just accepting the defaults:



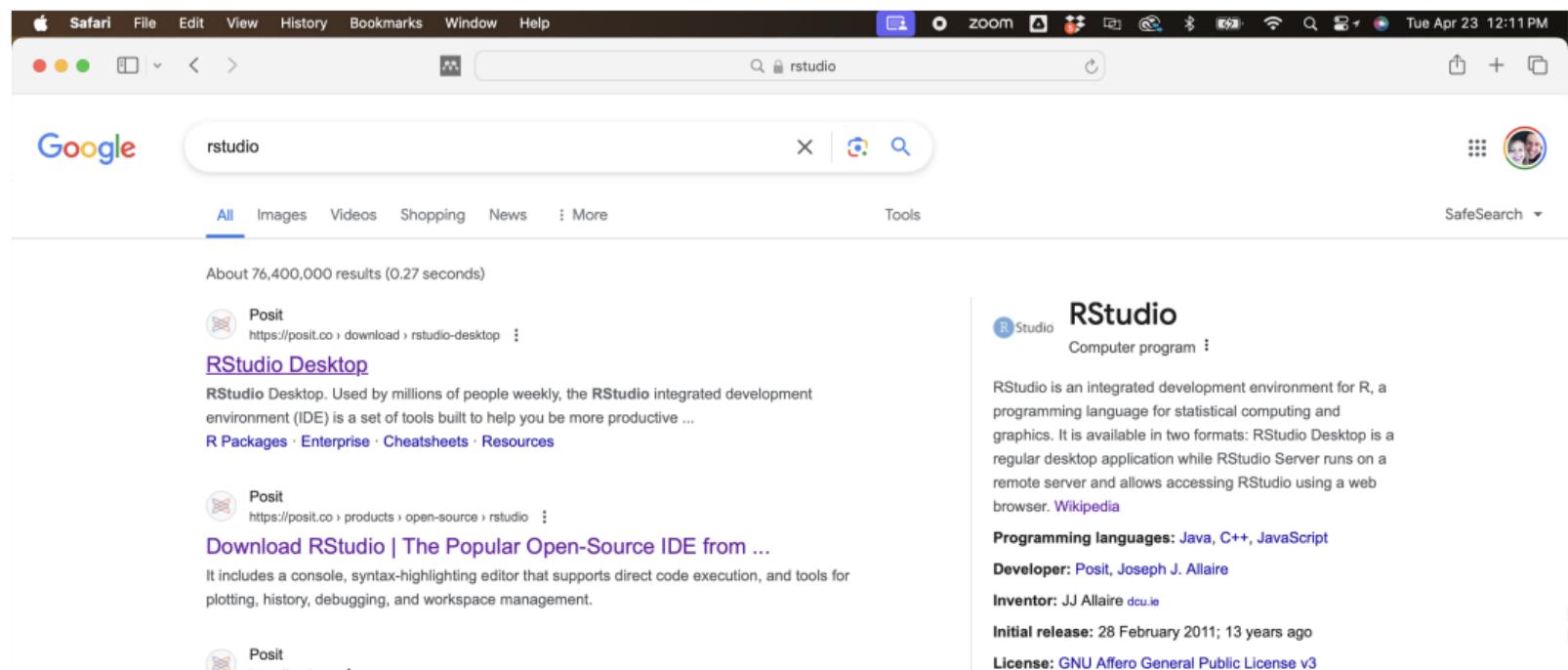
Installing R (Mac)

Congratulations! You have installed R.



Installing RStudio (Windows and Mac)

To install RStudio, start by searching for “RStudio” on your browser:



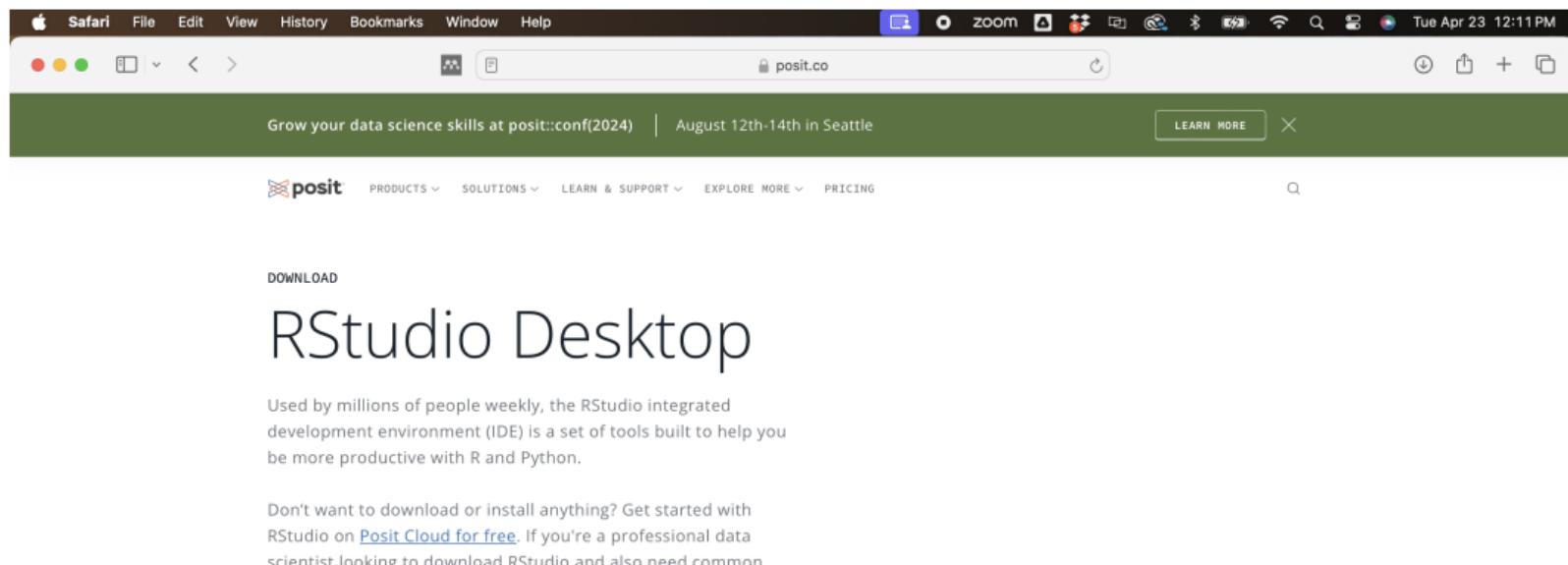
A screenshot of a web browser window showing search results for "rstudio". The browser is identified as Safari, and the search bar contains "rstudio". The results page from Google shows approximately 76,400,000 results. Two main search results are highlighted:

- RStudio Desktop** (Posit): A link to the RStudio Desktop website, which describes it as an integrated development environment (IDE) used by millions weekly. It includes links to R Packages, Enterprise, Cheatsheets, and Resources.
- Download RStudio | The Popular Open-Source IDE from ...** (Posit): A link to the RStudio download page, which describes it as an open-source IDE supporting direct code execution, plotting, history, debugging, and workspace management.

On the right side of the results, there is a snippet for the RStudio computer program, which is described as an integrated development environment for R, a programming language for statistical computing and graphics. It is available in two formats: RStudio Desktop (a regular desktop application) and RStudio Server (which runs on a remote server and can be accessed via a web browser). The snippet also lists programming languages (Java, C++, JavaScript), developer (Joseph J. Allaire), and inventor (JJ Allaire).

Installing RStudio (Mac)

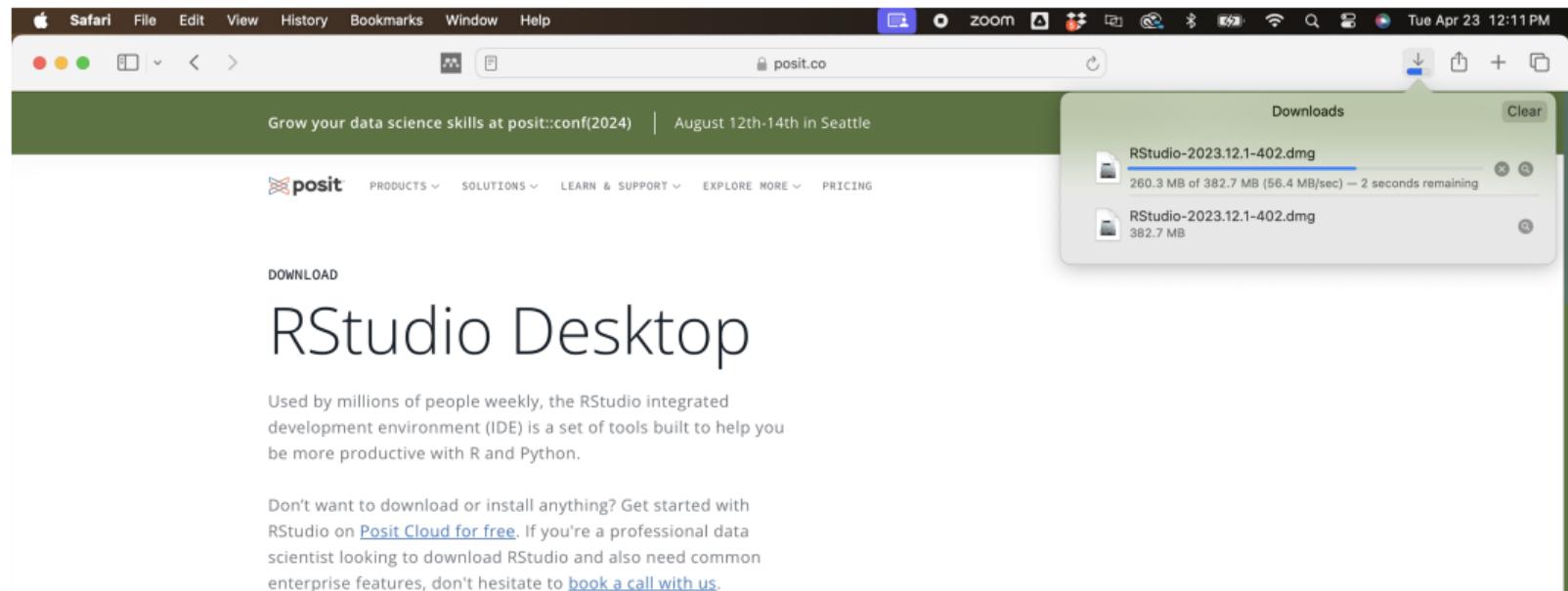
You should find the Posit/RStudio website as shown above. Once there, click on “Download RStudio Desktop for Mac OS 12+” below the *2: Install RStudio* header. We first focus on Mac installation.



The screenshot shows a Mac OS X desktop with a Safari browser window open to the Posit/RStudio website. The browser's top bar includes the title 'posit.co' and various system icons like battery level, signal strength, and volume. The main content area of the browser displays the Posit website's homepage. At the top of the page, there's a navigation bar with links for 'Safari', 'File', 'Edit', 'View', 'History', 'Bookmarks', 'Window', and 'Help'. Below this is a toolbar with standard Mac OS X controls. A banner at the top of the page reads 'Grow your data science skills at posit::conf(2024) | August 12th-14th in Seattle' with a 'LEARN MORE' button and a close 'X'. The main content features the 'posit' logo and navigation links for 'PRODUCTS', 'SOLUTIONS', 'LEARN & SUPPORT', 'EXPLORE MORE', and 'PRICING'. A search icon is also present. The central part of the page is titled 'DOWNLOAD' and features a large, bold heading 'RStudio Desktop'. Below the heading, a paragraph explains that RStudio is an integrated development environment (IDE) used by millions weekly to help users be more productive with R and Python. Another paragraph at the bottom encourages users who don't want to download or install anything to start with RStudio on 'Posit Cloud for free'. The bottom right corner of the page has a small logo for 'Center for Data Science'.

Installing RStudio (Mac)

The download process should start. For Safari on Mac, you should see the progress in the bar at the top right. Double click on the download when its complete.



A screenshot of a Mac desktop showing a Safari browser window. The address bar shows 'posit.co'. The main content area displays information about 'posit::conf(2024)' and a large 'DOWNLOAD' button for 'RStudio Desktop'. A download progress bar is visible in the top right corner of the browser window, indicating a file named 'RStudio-2023.12.1-402.dmg' is being downloaded at 260.3 MB of 382.7 MB (56.4 MB/sec) with 2 seconds remaining. The desktop background features a green and blue abstract design.

Safari File Edit View History Bookmarks Window Help

zoom

Tue Apr 23 12:11PM

posit.co

Grow your data science skills at posit::conf(2024) | August 12th-14th in Seattle

posit PRODUCTS SOLUTIONS LEARN & SUPPORT EXPLORE MORE PRICING

DOWNLOAD

RStudio Desktop

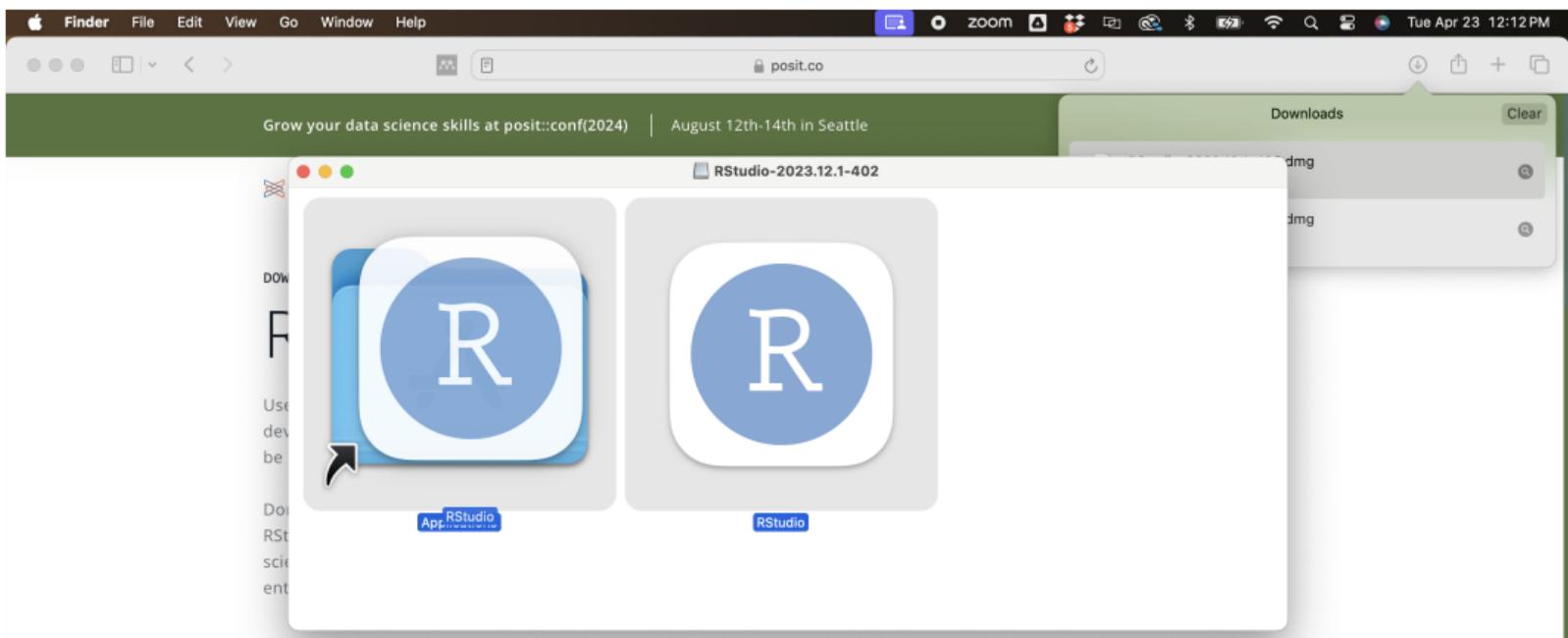
Used by millions of people weekly, the RStudio integrated development environment (IDE) is a set of tools built to help you be more productive with R and Python.

Don't want to download or install anything? Get started with RStudio on [Posit Cloud for free](#). If you're a professional data scientist looking to download RStudio and also need common enterprise features, don't hesitate to [book a call with us](#).

Center for Data Science

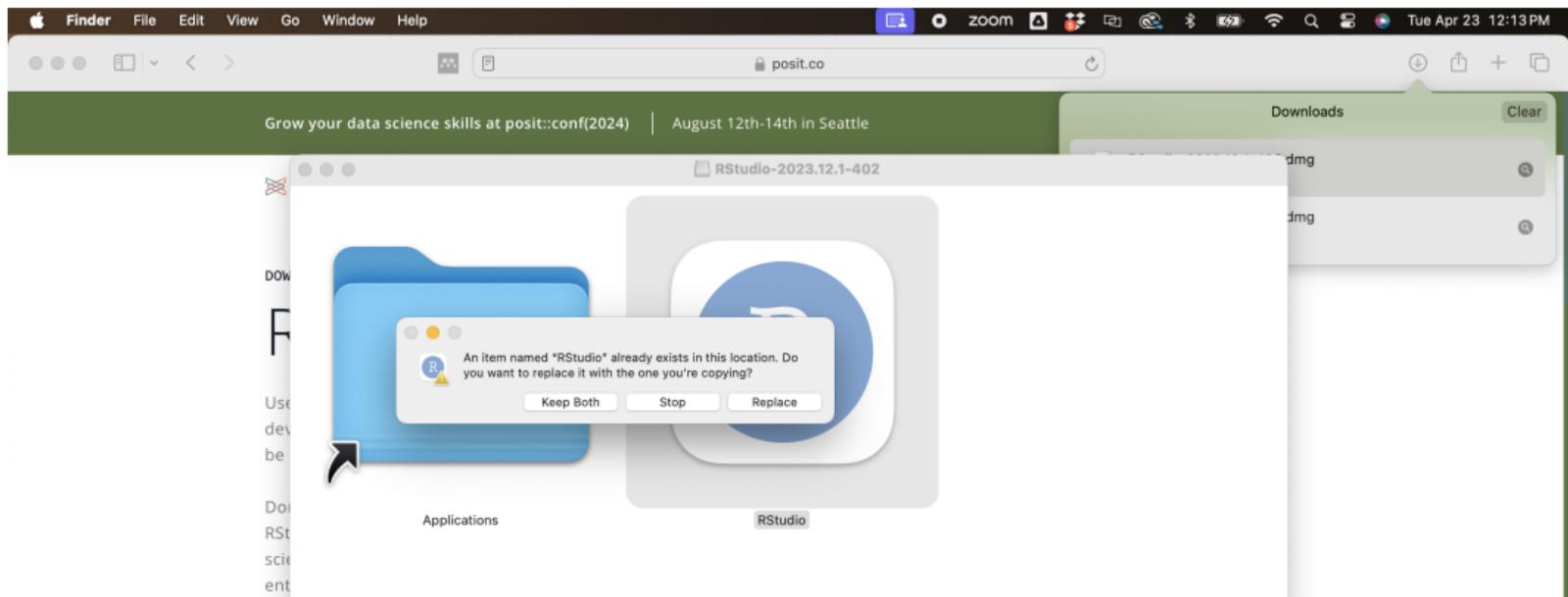
Installing RStudio (Mac)

Now drag and drop the RStudio icon over the Applications icon:



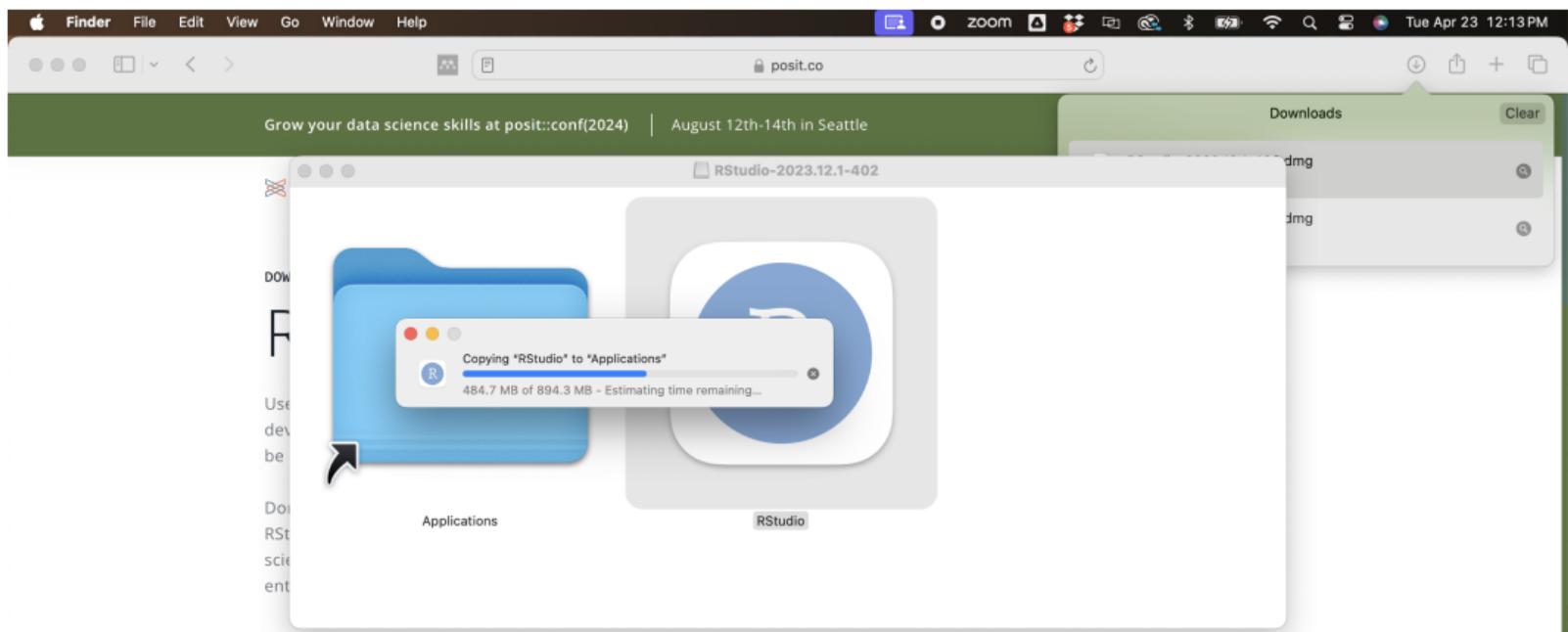
Installing RStudio (Mac)

If you have a previous version of RStudio installed, it may ask if you want to overwrite the old version. We usually want to replace the old with the new, so click “Replace”.



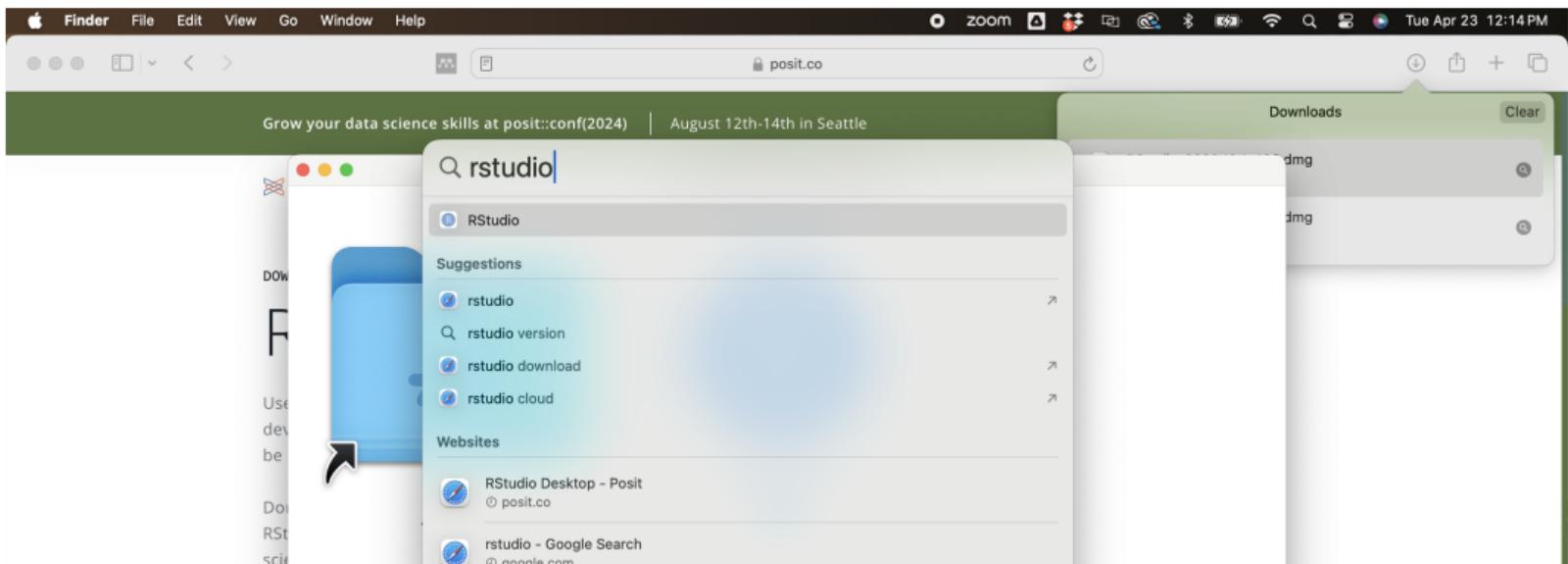
Installing RStudio (Mac)

The system should copy RStudio to the Applications folder:



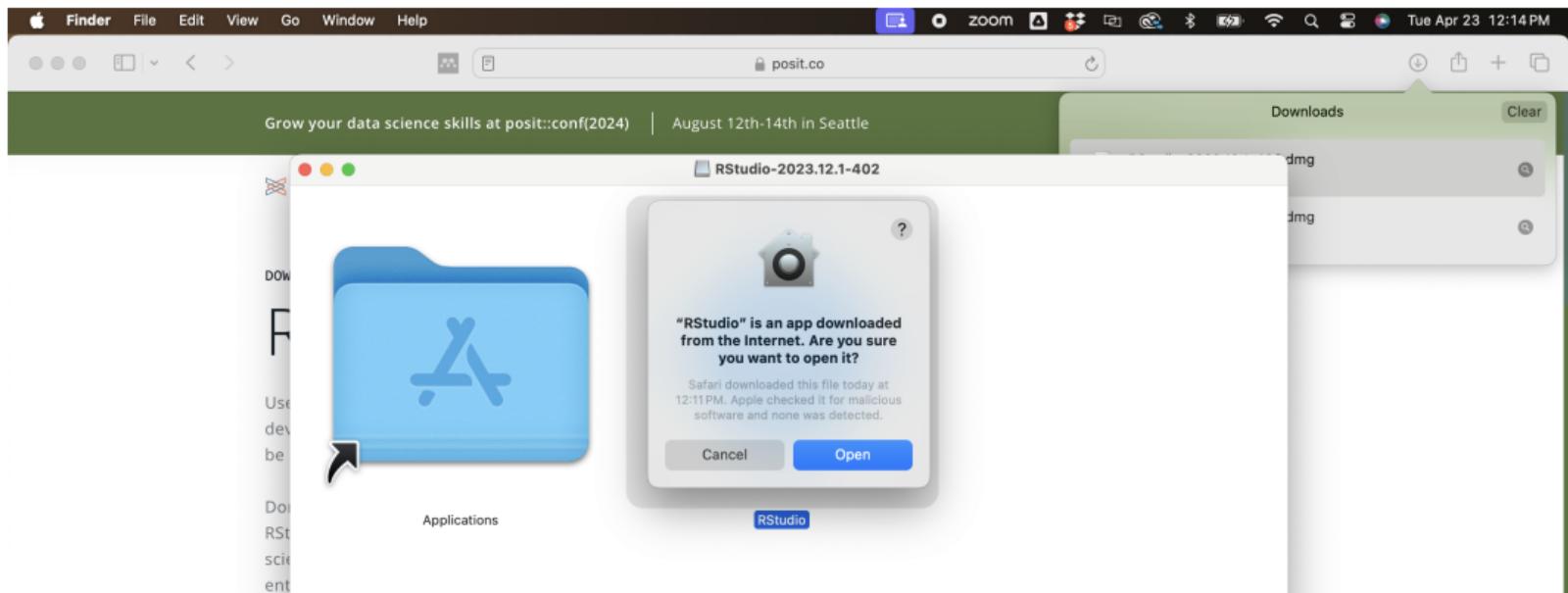
Running RStudio (Mac)

Congratulations! You have installed RStudio. On the Mac, it will be in the Applications folder. Or you can click on the *Spotlight Search* (magnifying glass in top right corner) and type `rstudio` into that search bar, then hit enter.



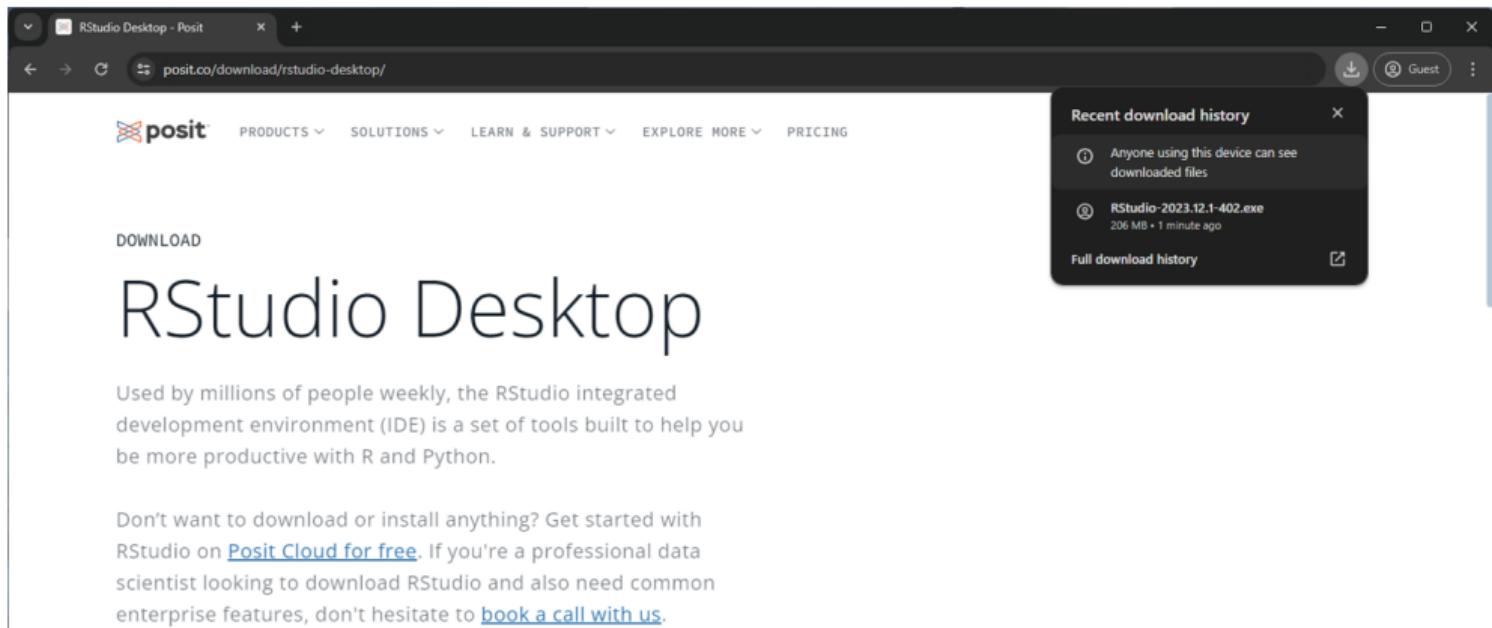
Installing RStudio (Mac)

You may get a warning that RStudio is an application downloaded from the internet. Go ahead and click “Open”.



Installing RStudio (Windows)

For Windows, the process is similar. From the RStudio main page, click on “Download RStudio Desktop for Windows” below the *2: Install RStudio* header.



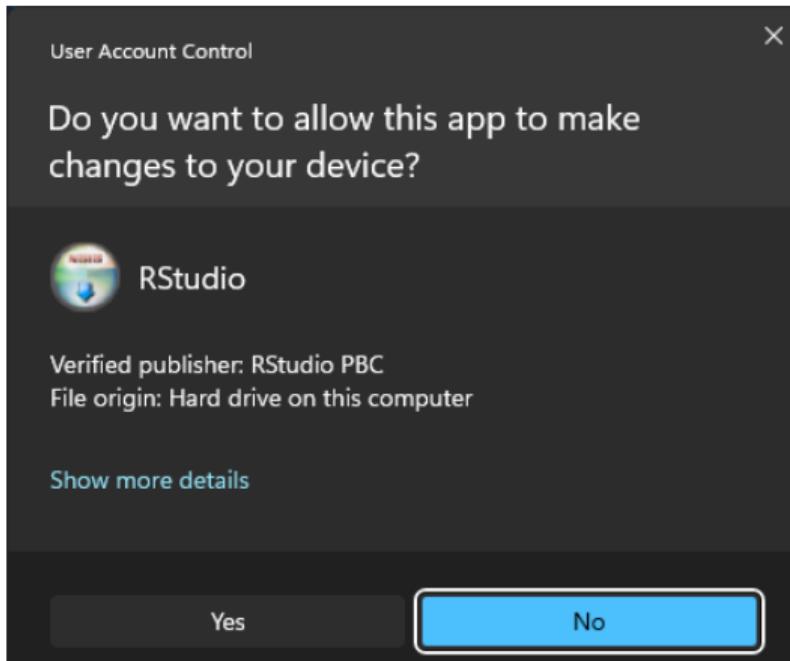
The screenshot shows a web browser window for 'posit' with the URL 'posit.co/download/rstudio-desktop/'. The page features a large 'DOWNLOAD' button and the heading 'RStudio Desktop'. Below the heading, a paragraph explains that RStudio is used by millions weekly as an integrated development environment for R and Python. At the bottom, there's a note about starting with RStudio on Posit Cloud for free or booking a call with us. A 'Recent download history' sidebar is visible on the right, showing a single entry for 'RStudio-2023.12.1-402.exe' downloaded 206 MB ago.

Used by millions of people weekly, the RStudio integrated development environment (IDE) is a set of tools built to help you be more productive with R and Python.

Don't want to download or install anything? Get started with RStudio on [Posit Cloud for free](#). If you're a professional data scientist looking to download RStudio and also need common enterprise features, don't hesitate to [book a call with us](#).

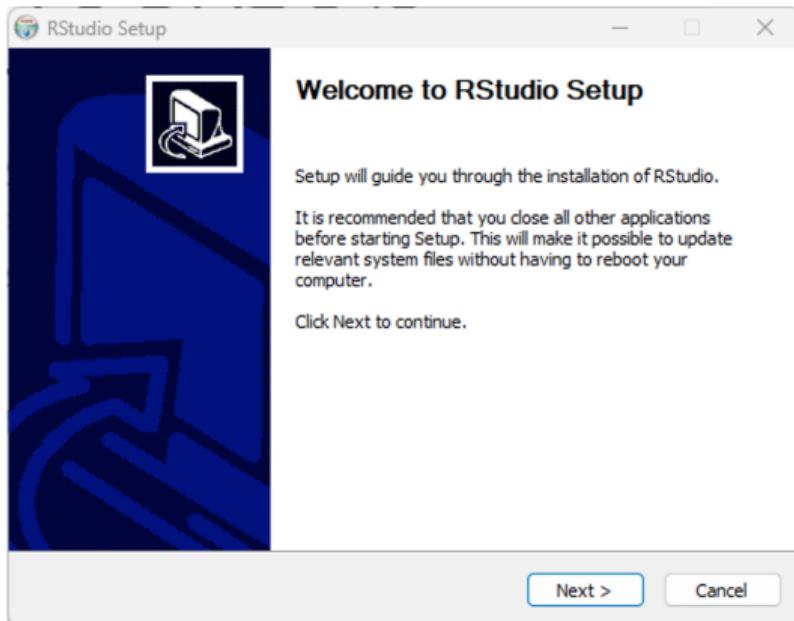
Installing RStudio (Windows)

You may receive a warning, just click “Yes” to continue the install.



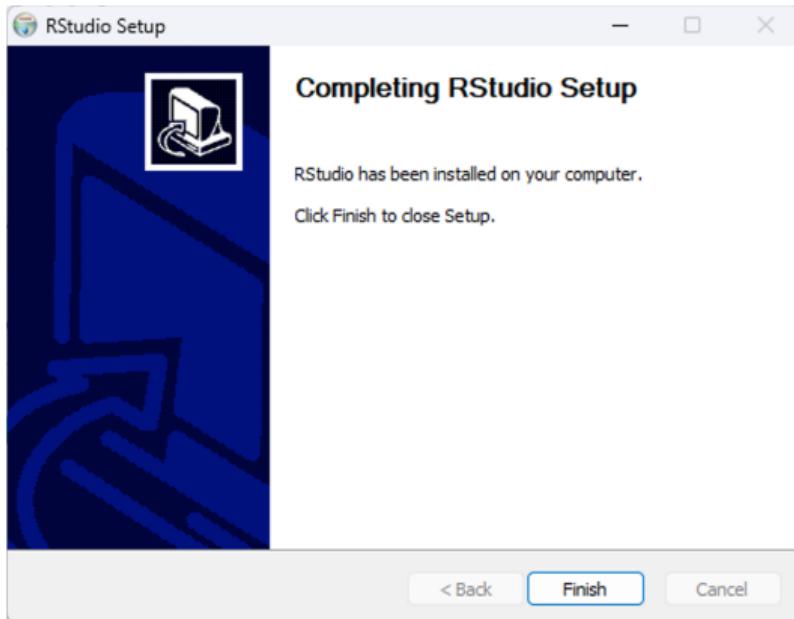
Installing RStudio (Windows)

Follow the instructions to install RStudio, defaults are fine.



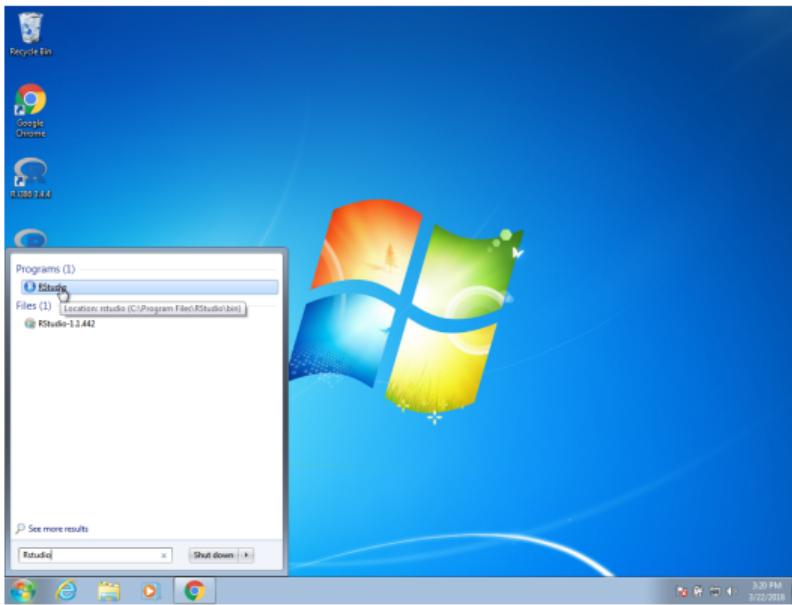
Installing RStudio (Windows)

Congratulations! You are done!



Running RStudio (Windows)

On Windows, you can open RStudio from the *Start* menu:



Getting started: Why R?

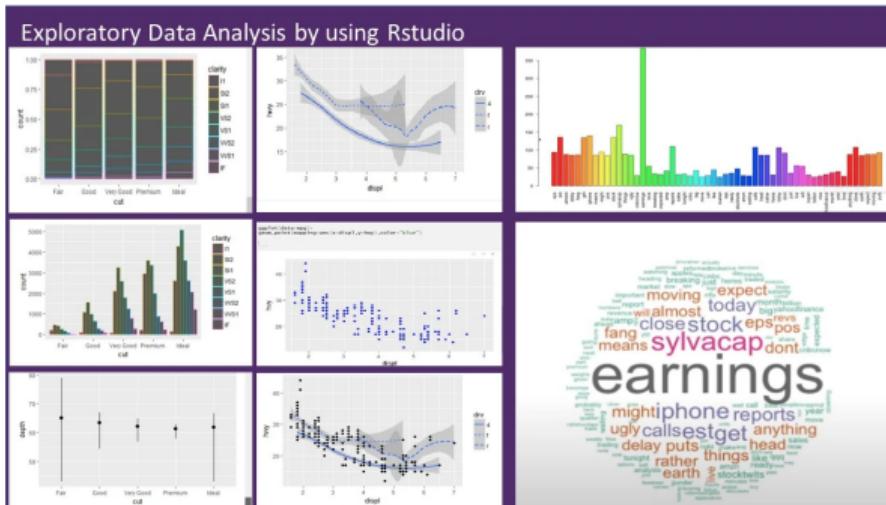
R is not a programming language for software development like C or Java. It was created by statisticians as an environment for data analysis. A history of R is summarized here: [A Brief History of S](#).

The **interactivity** of R (more later), is an indispensable feature in data science because, as you will learn, the ability to quickly explore data is a necessity for success in this field.

Getting started: Why R?

R does not follow conventions of “traditional” programming languages. However, R has unmatched utility when it comes to data analysis and data visualization.

A history of R is summarized here: A Brief History of S.



Getting started: Why R?

Other attractive features of R are:

1. R is free and open source.
2. It runs on all major platforms: Windows, Mac Os, UNIX/Linux.
3. Scripts and data objects can be shared seamlessly across platforms.
4. There is a large, growing, and active community of R users and, as a result, there are numerous resources for learning and asking questions^{1 2 3}.
5. It is easy for others to contribute add-ons which enables developers to share software implementations of new data science methodologies.

¹<https://www.r-project.org/help.html>

²<https://stackoverflow.com/documentation/r/topics>

³<https://stats.stackexchange.com/questions/138/free-resources-for-learning-r>

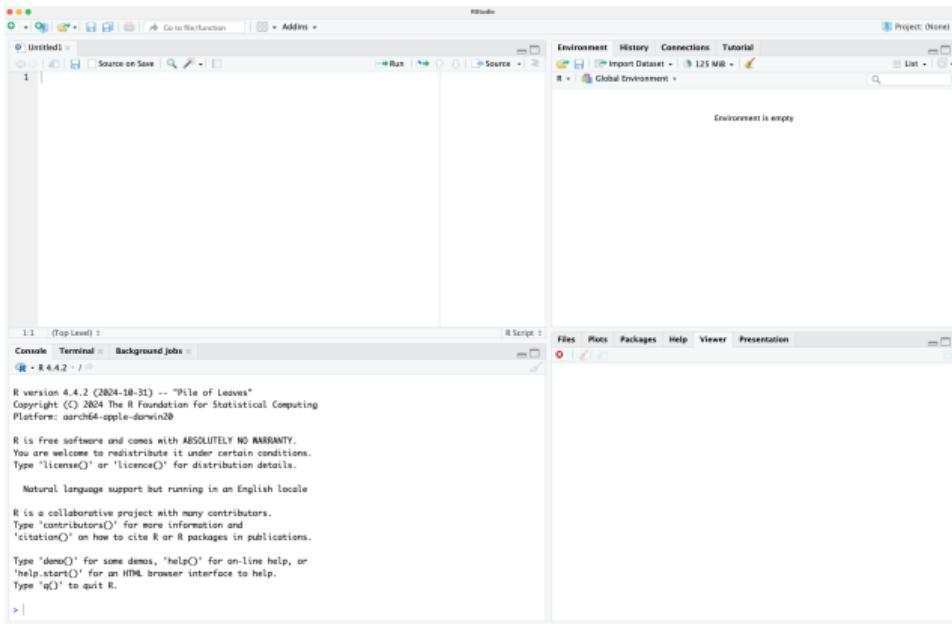
RStudio

RStudio will be our launching pad for data science projects. It provides an editor for our scripts and provides many other useful tools. Here are some of the basics.



RStudio Panes

When you start RStudio, you will see three or four panes:



The R console

Interactive data analysis usually occurs on the *R console*. As a quick example, try using the console to calculate a 15% tip on a meal that cost \$19.71:

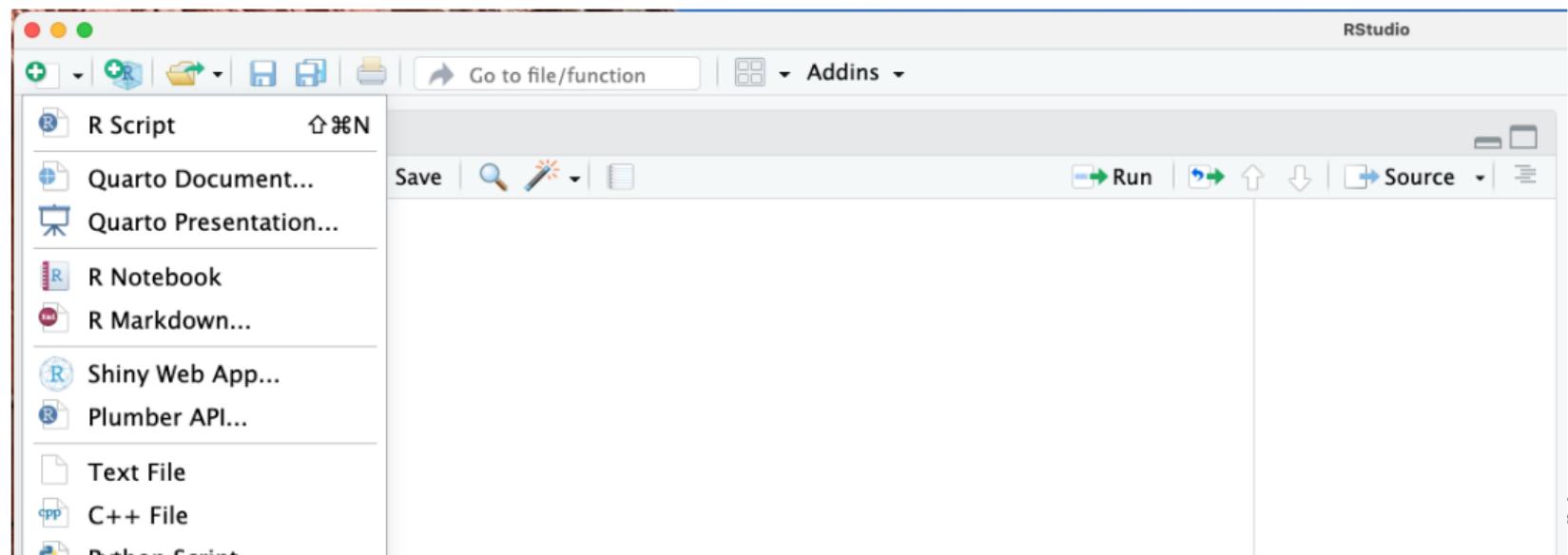
```
0.15 * 19.71
```

```
## [1] 2.9565
```

Pro Tip: Grey boxes in the lecture notes are used to show R code typed into the R console. The symbol ## is used to denote what the R console outputs.

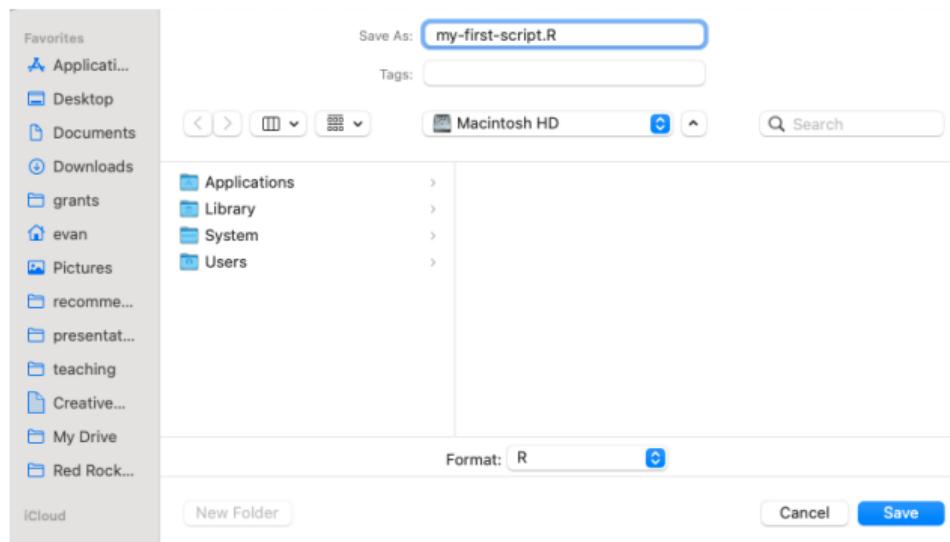
Running commands while editing scripts

Let's start by opening a new script and giving the script a name. We can do this through the editor by saving the current new unnamed script.



Running commands while editing scripts

When saving a script, a good convention is to use a descriptive name, with lower case letters, no spaces, only hyphens to separate words, and then followed by the suffix `.R`. We will call this script `my-first-script.R`.



Running commands while editing scripts

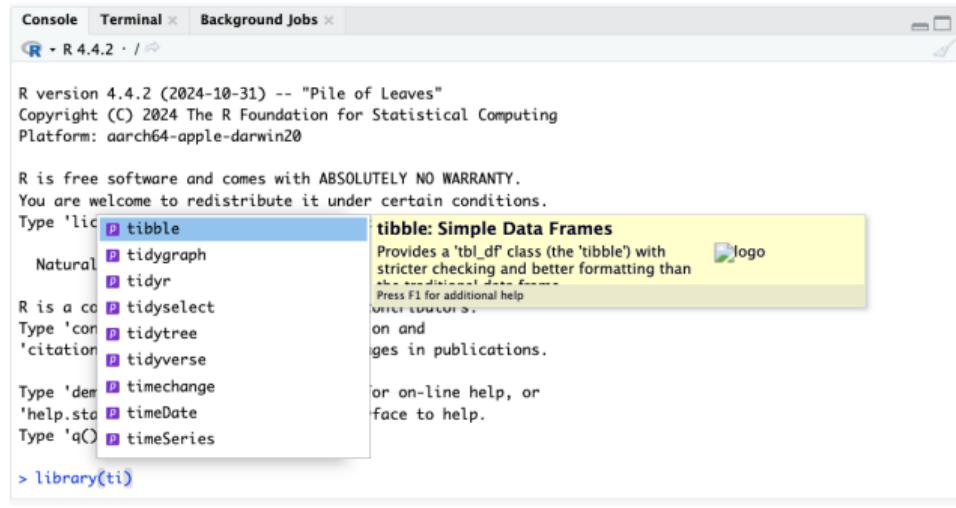
Now we are ready to start running our first script. There are many ways to execute a script in R/RStudio:

1. **Run Line by Line:** Place the cursor on a line and press **Ctrl+Enter** (Windows/Linux) or **Cmd+Enter** (Mac).
2. **Select and Run:** Highlight code and press **Ctrl+Enter** (Windows/Linux) or **Cmd+Enter** (Mac).
3. **Run Entire Script:** Click **Source** or press **Ctrl+Shift+Enter** (Windows/Linux) or **Cmd+Shift+Enter** (Mac).
4. **Use `source()`:** Execute the script from the console with:

```
source("path/to/your_script.R")
```

Organizing scripts

The first lines of code in an R script are dedicated to loading the libraries we will use. One useful feature is RStudio's auto-complete: note what happens when we type `library(ti):`



A screenshot of the RStudio interface showing the R console. The console tab is active, displaying the R startup message:

```
R version 4.4.2 (2024-10-31) -- "Pile of Leaves"
Copyright (C) 2024 The R Foundation for Statistical Computing
Platform: aarch64-apple-darwin20

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
```

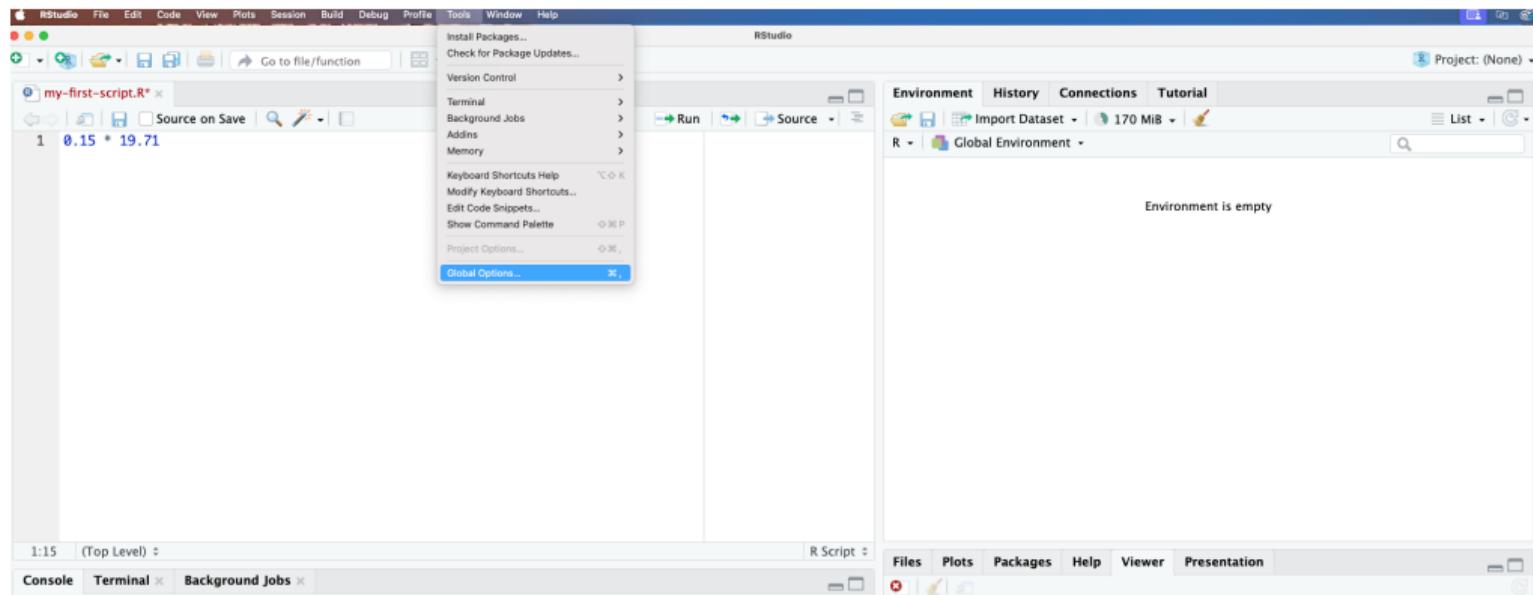
Below the message, the user has typed `> library(ti)`. An auto-complete dropdown menu is open, showing suggestions for packages starting with 'ti'. The suggestion `tibble` is highlighted. A detailed tooltip for `tibble` is displayed, describing it as a `Simple Data Frames` class that provides stricter checking and better formatting than `tbl_df`. It also mentions `tidyverse`, `on`, and `ges` in publications. The tooltip ends with instructions to press F1 for additional help or face to help.

> library(ti)

Changing global options

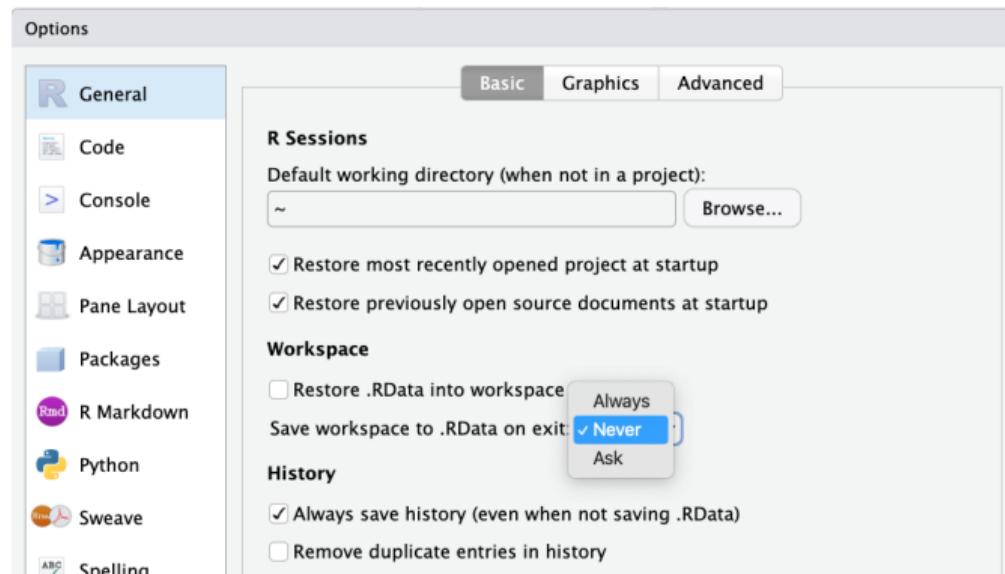
You can change the look and functionality of RStudio quite a bit.

To change global options you click on *Tools* then *Global Options*:



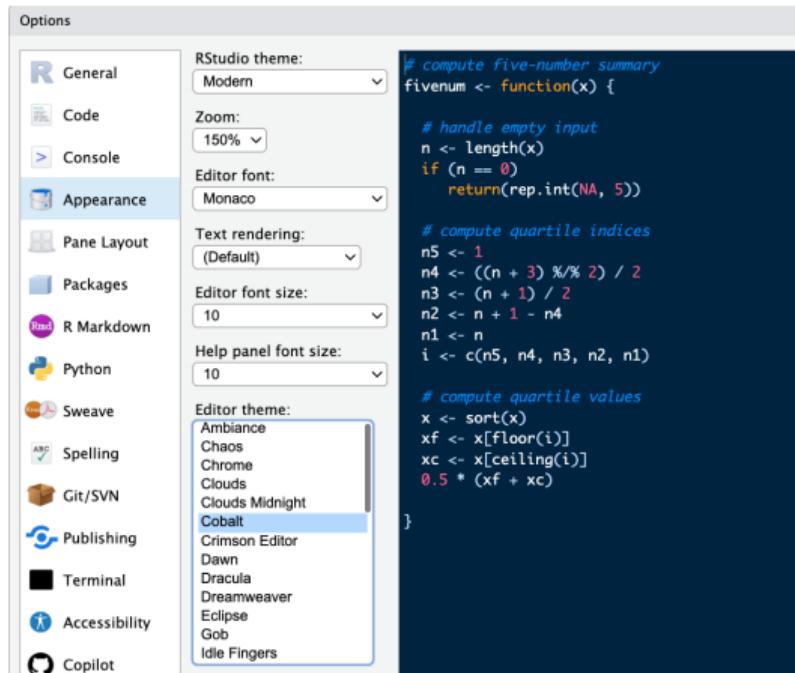
Changing global options

I **highly recommend** to change the *Save workspace to .RData on exit* to *Never* and uncheck the *Restore .RData into workspace at start*. To change these options, make your *General* settings look like this:



Changing global options

Also, click on *Appearance* then try the *Cobalt* option for the *Editor theme*:



Installing R packages

The functionality provided by a fresh install of R is only a small fraction of what is possible. In fact, we refer to what you get after your first install as **base R**. The extra functionality comes from add-ons available from developers.

There are currently hundreds of these available from CRAN and many others shared via other repositories such as GitHub. However, because not everybody needs all available functionality, R instead makes different components available via **packages**.

Installing R packages

R makes it very easy to install packages from within R. For example, to install the **tidyverse** package, which we use to wrangle data in later sessions:

```
install.packages("tidyverse")
```

We can install more than one package at once by feeding a character vector to this function:

```
install.packages(c("tidyverse", "ggplot2"))
```

Installing R packages (Windows)

If you are using Windows, you may get a warning that says:

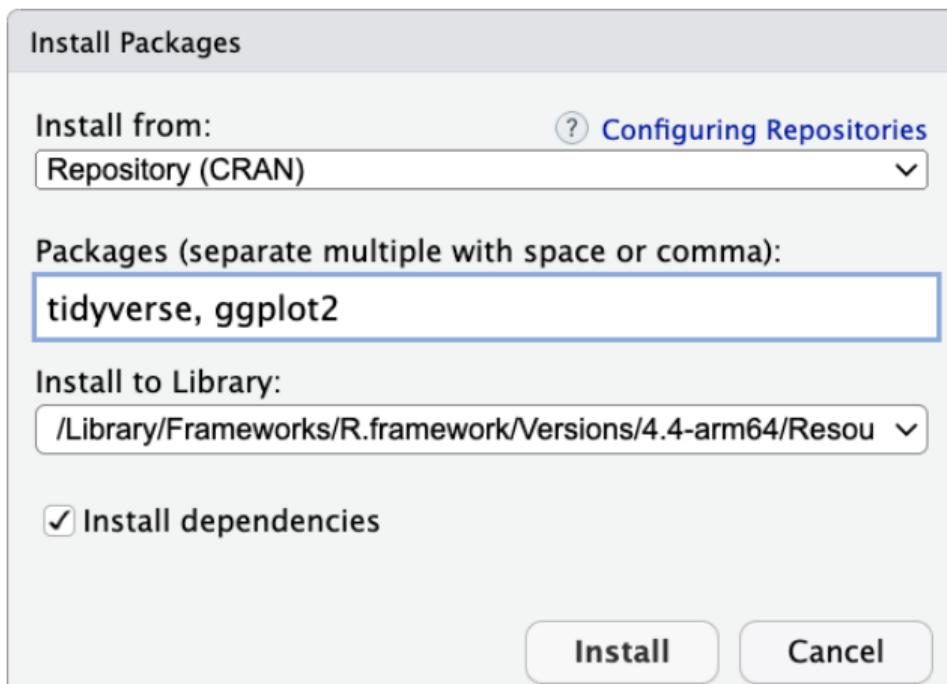
WARNING: Rtools is required to build R packages but is not currently installed.

Rtools is a toolchain bundle used for building R packages from source (those that need compilation of C/C++ or Fortran code) and to build R itself from source. We won't cover this here, but for a detailed step-by-step instruction tutorial can be found by clicking the following link:

https://jtleek.com/modules/01_DataScientistToolbox/02_10_rtools/

Installing R packages

In RStudio, you can navigate to the **Tools** tab and select install packages this way:



Installing R packages

Remember packages are installed in R not RStudio. Also note that installing **tidyverse** actually installs several packages. This commonly occurs when a package has **dependencies**, or uses functions from other packages. When you load a package using `library`, you also load its dependencies.

Installing R packages

Once packages are installed, you can load them into R using the `library` function:

```
library(tidyverse)
```

As you go through this tutorial, you will see that we load packages without installing them. This is because once you install a package, it remains installed and only needs to be loaded with `library`. The package remains loaded until we quit the R session. If you try to load a package and get an error, it probably means you need to install it first.

Installing R packages

Pro Tip: It is helpful to keep a list of all the packages you need for your work in a script because if you need to perform a fresh install of R, you can re-install all your packages by simply running a script.

You can see all the packages you have installed using the following function:

```
installed.packages()
```

Session Info

The `sessionInfo()` function reports information about your R session. Its always good to end your analyses and reports with this function for reproducibility.

```
sessionInfo()

## R version 4.4.2 (2024-10-31)
## Platform: aarch64-apple-darwin20
## Running under: macOS Sonoma 14.2.1
##
## Matrix products: default
## BLAS:    /Library/Frameworks/R.framework/Versions/4.4-arm64/Resources/lib/libRblas.0.dylib
## LAPACK:  /Library/Frameworks/R.framework/Versions/4.4-arm64/Resources/lib/libRlapack.dylib;  LAPACK version 3.12.0
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## time zone: America/Denver
## tzcode source: internal
##
## attached base packages:
## [1] stats      graphics   grDevices  utils       datasets   methods    base
##
## loaded via a namespace (and not attached):
## [1] compiler_4.4.2  fastmap_1.2.0   cli_3.6.3      tools_4.4.2
## [5] htmltools_0.5.8.1 rstudioapi_0.16.0 yaml_2.3.10    rmarkdown_2.28
## [9] knitr_1.48     xfun_0.47      digest_0.6.37   rlang_1.1.4
## [13] evaluate_1.0.0
```