

ASMS 2019
ANNUAL
CONFERENCE
WORKSHOP



INSTALLING R & RSTUDIO

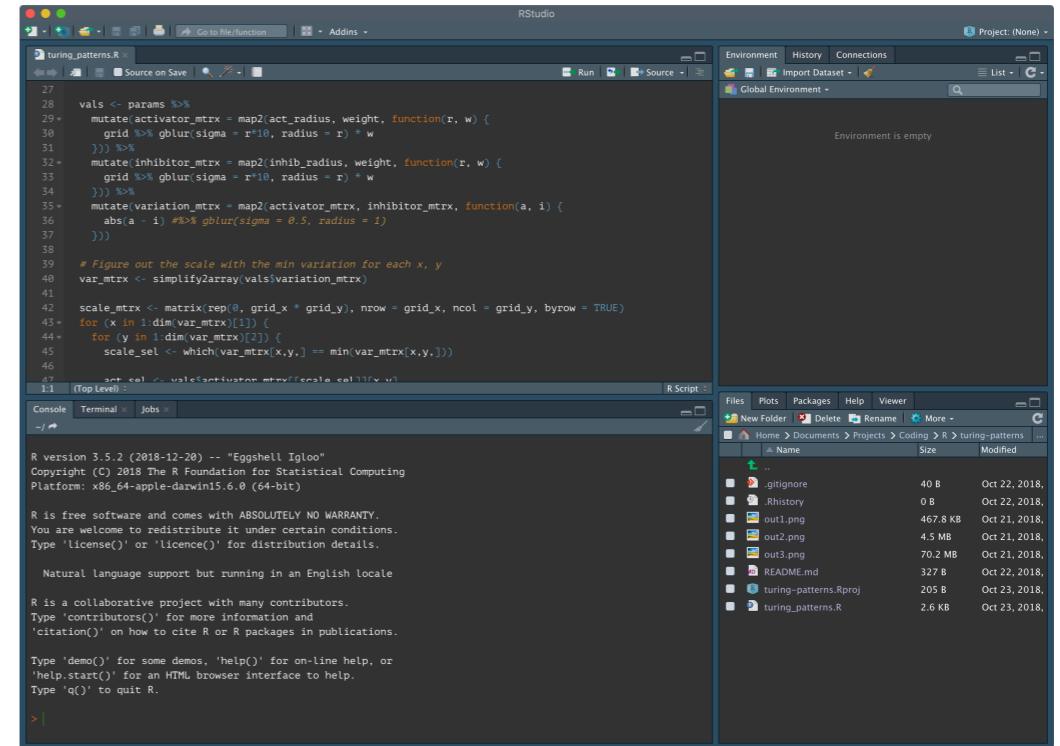
R IS NOT RSTUDIO (AND VICE VERSA)



First, you'll install R

R is the “engine”

There are some other fiddly bits to install too depending on the platform...



The screenshot shows the RStudio IDE interface. The top menu bar includes 'File', 'Edit', 'Source', 'Run', 'View', 'Tools', 'Help', and 'Addins'. The main area has tabs for 'turing_patterns.R' (selected), 'Console', 'Plots', 'Packages', 'Help', and 'Viewer'. The 'Console' tab shows R version 3.5.2 starting up. The 'Source' tab displays R code for generating Turing patterns. The 'Files' tab shows a project structure with files like 'turing_patterns.Rproj', 'turing_patterns.R', 'README.md', and several output images ('out1.png', 'out2.png', 'out3.png'). The 'Global Environment' pane is empty.

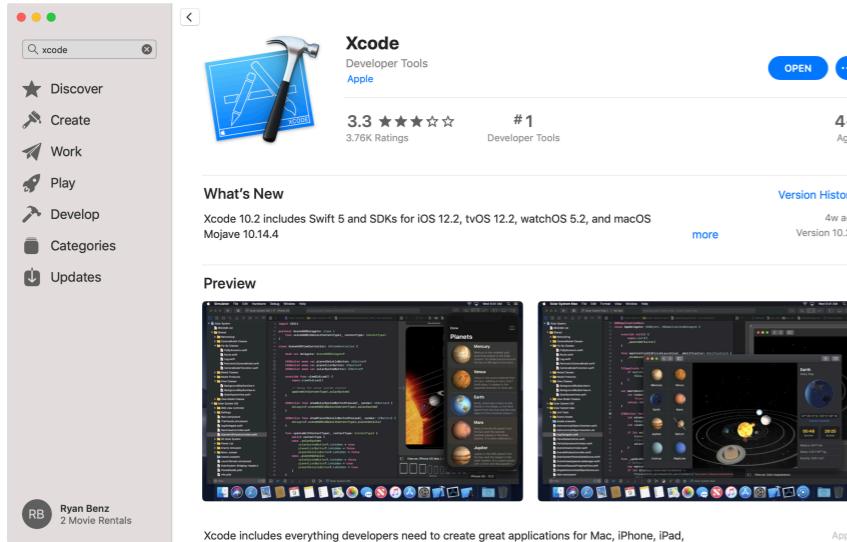
Then, you'll install RStudio

RStudio is the awesome
“car body and paint job”

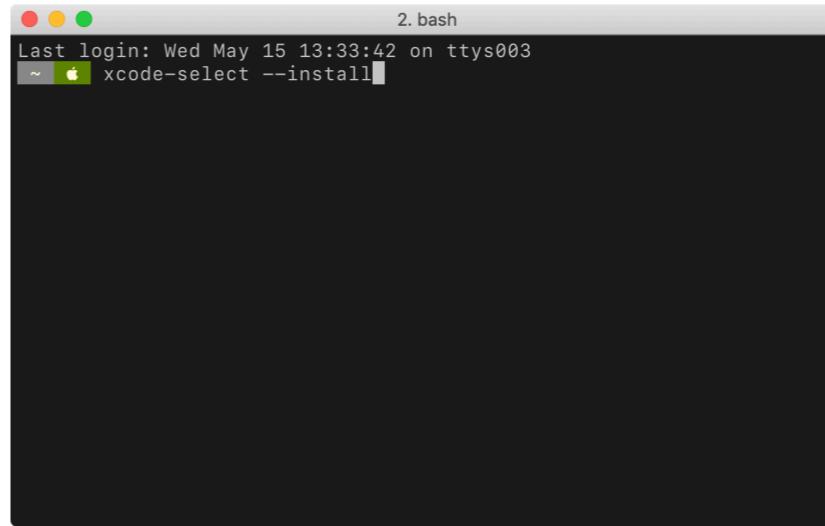
MAC INSTRUCTIONS

INSTALLING R ON THE MAC — THE OVERVIEW

1. Install Xcode



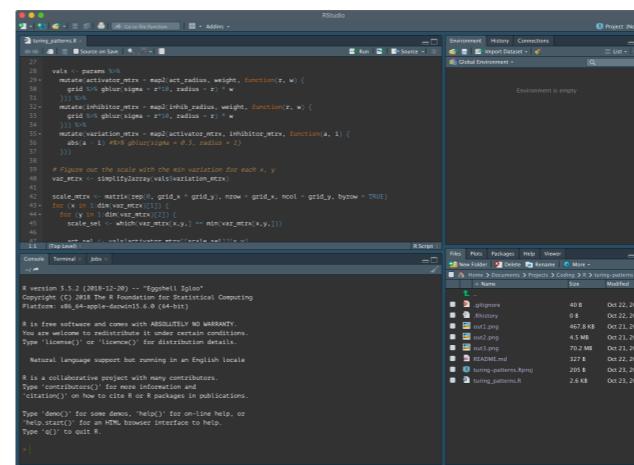
2. Install the Command line tools



3. Install R



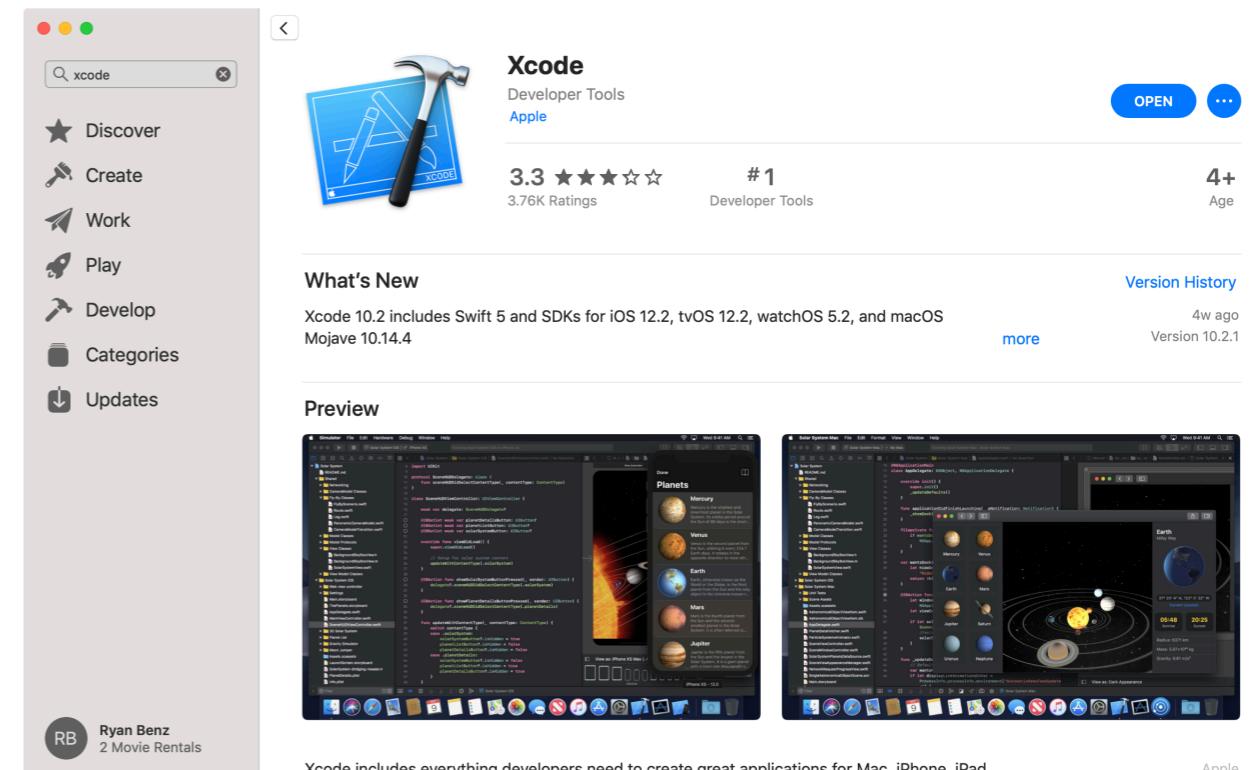
4. Install RStudio



INSTALLING R ON THE MAC — XCODE

We need to install Xcode because it provides tools we need to install certain R packages

1. Open the “App Store”



2. Search for Xcode

3. Install Xcode

INSTALLING R ON THE MAC — COMMAND LINE TOOLS

The command line tools are actually what we really need, but we install them after Xcode is installed

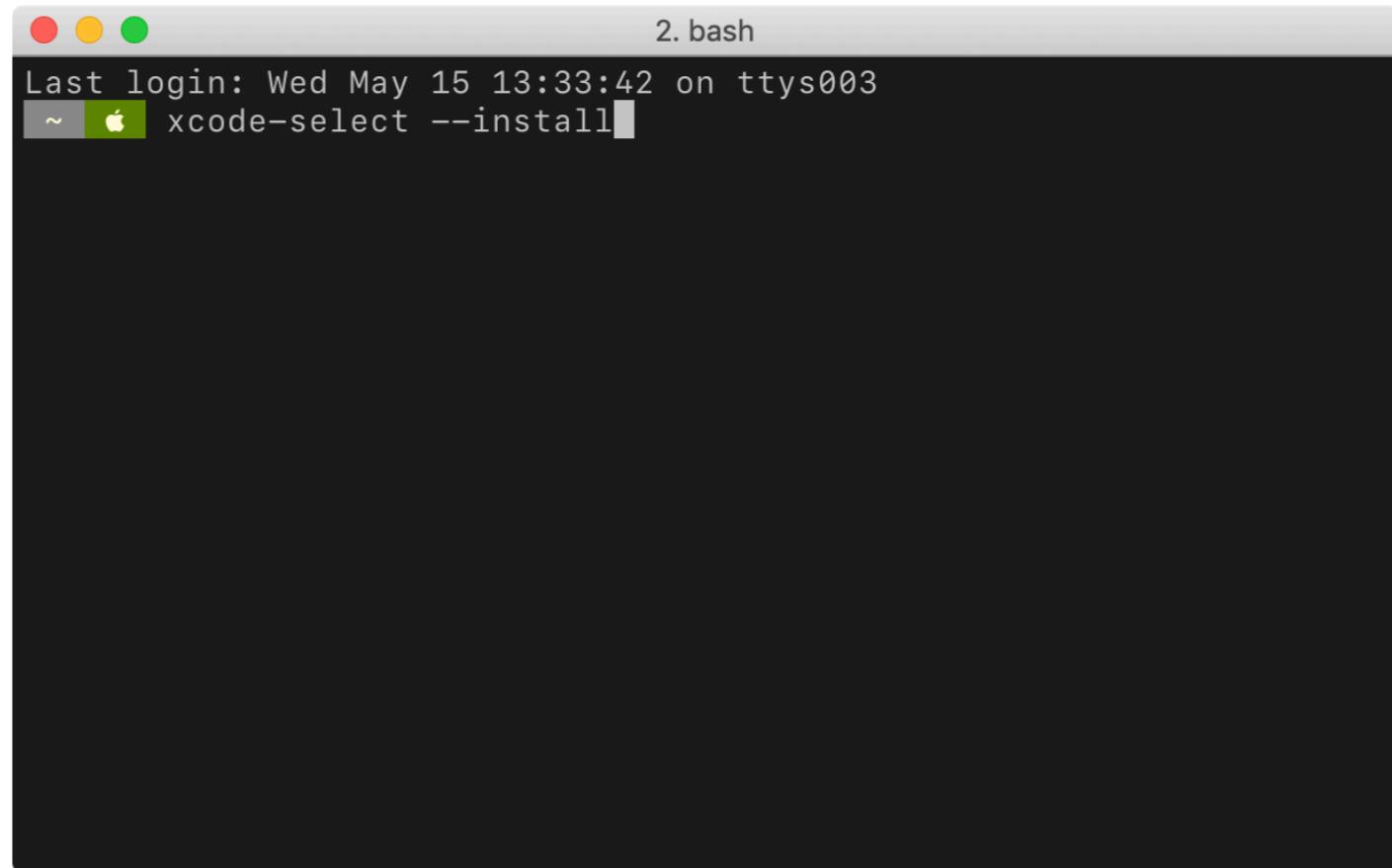
1. Open the “Terminal”

Applications → Utilities → Terminal.app

2. Copy and pasted this:

`xcode-select --install`

3. Press enter and wait for install to complete



A screenshot of a Mac OS X terminal window titled "2. bash". The window shows the command "xcode-select --install" being typed at the prompt. The terminal has a dark background with light-colored text. The window title bar includes the number "2" and the word "bash". The status bar at the bottom of the screen shows the date and time: "Last login: Wed May 15 13:33:42 on ttys003".

If you already have the command line tools installed, it will print a message that says so; just continue on

INSTALLING R ON THE MAC — R

Now it's time to install R – download at <https://www.r-project.org>



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The R Project for Statistical Computing

Getting Started

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If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

News

- **R version 3.6.0 (Planting of a Tree)** has been released on 2019-04-26.
- useR! 2020 will take place in St. Louis, Missouri, USA.
- **R version 3.5.3 (Great Truth)** has been released on 2019-03-11.
- The R Foundation Conference Committee has released a [call for proposals](#) to host useR! 2020 in North America.
- You can now support the R Foundation with a renewable subscription as a [supporting member](#).

INSTALLING R ON THE MAC — R

Choose a mirror

CRAN Mirrors

The Comprehensive R Archive Network is available at the following URLs, please choose a location close to you. Some statistics on the status of the mirrors can be found here: [main page](#), [windows release](#), [windows old release](#).

If you want to host a new mirror at your institution, please have a look at the [CRAN Mirror HOWTO](#).

0-Cloud

This is a good choice

<https://cloud.r-project.org/>



<http://cloud.r-project.org/>

Algeria

<https://cran.usthb.dz/>

<http://cran.usthb.dz/>

Argentina

<http://mirror.fcaglp.unlp.edu.ar/CRAN/>

Australia

<https://cran.csiro.au/>

Automatic redirection to servers worldwide, currently sponsored by Rstudio

Automatic redirection to servers worldwide, currently sponsored by Rstudio

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[The R Journal](#)

[Software](#)
[R Sources](#)
[R Data](#)

The Comprehensive R Archive Network

Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#) ←
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

Source Code for all Platforms

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!

INSTALLING R ON THE MAC — R

Download the complete package, then install



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R for Mac OS X

This directory contains binaries for a base distribution and packages to run on Mac OS X (release 10.6 and above). Mac OS 8.6 to 9.2 (and Mac OS X 10.1) are no longer supported but you can find the last supported release of R for these systems (which is R 1.7.1) [here](#). Releases for old Mac OS X systems (through Mac OS X 10.5) and PowerPC Macs can be found in the [old](#) directory.

Note: CRAN does not have Mac OS X systems and cannot check these binaries for viruses. Although we take precautions when assembling binaries, please use the normal precautions with downloaded executables.

As of 2016/03/01 package binaries for R versions older than 2.12.0 are only available from the [CRAN archive](#) so users of such versions should adjust the CRAN mirror setting accordingly.

R 3.6.0 "Planting of a Tree" released on 2019/04/26

Important: since R 3.4.0 release we are now providing binaries for OS X 10.11 (El Capitan) and higher using non-Apple toolkit to provide support for OpenMP and C++17 standard features. To compile packages you may have to download tools from the [tools](#) directory and read the corresponding note below.

Please check the MD5 checksum of the downloaded image to ensure that it has not been tampered with or corrupted during the mirroring process. For example type

`md5 R-3.6.0.pkg`
in the *Terminal* application to print the MD5 checksum for the R-3.6.0.pkg image. On Mac OS X 10.7 and later you can also validate the signature using

`pkgutil --check-signature R-3.6.0.pkg`

LATEST RELEASE:

[R-3.6.0.pkg](#)
MD5-hash: 64ede92058dde6c4e4c2c11e0ba8a60c
SHA1-hash: fe1ffed2c74322196db331fc1ec41fab3c40c385
(ca. 76MB)

R 3.6.0 binary for OS X 10.11 (El Capitan) and higher, signed package.
Contains R 3.6.0 framework, R.app GUI 1.70 in 64-bit for Intel Macs, Tcl/Tk 8.6.6 X11 libraries and Texinfo 5.2. 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.

Note: the use of X11 (including `tcltk`) requires [XQuartz](#) to be installed since it is no longer part of OS X. Always re-install XQuartz when upgrading your macOS to a new major version.

Important: this release uses Clang 7.0.0 and GNU Fortran 6.1, neither of

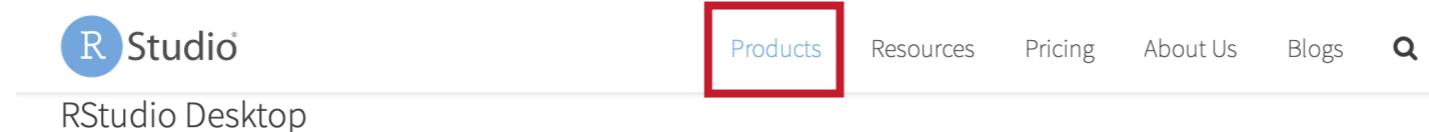
Choose this one
Version number could be
different in the future



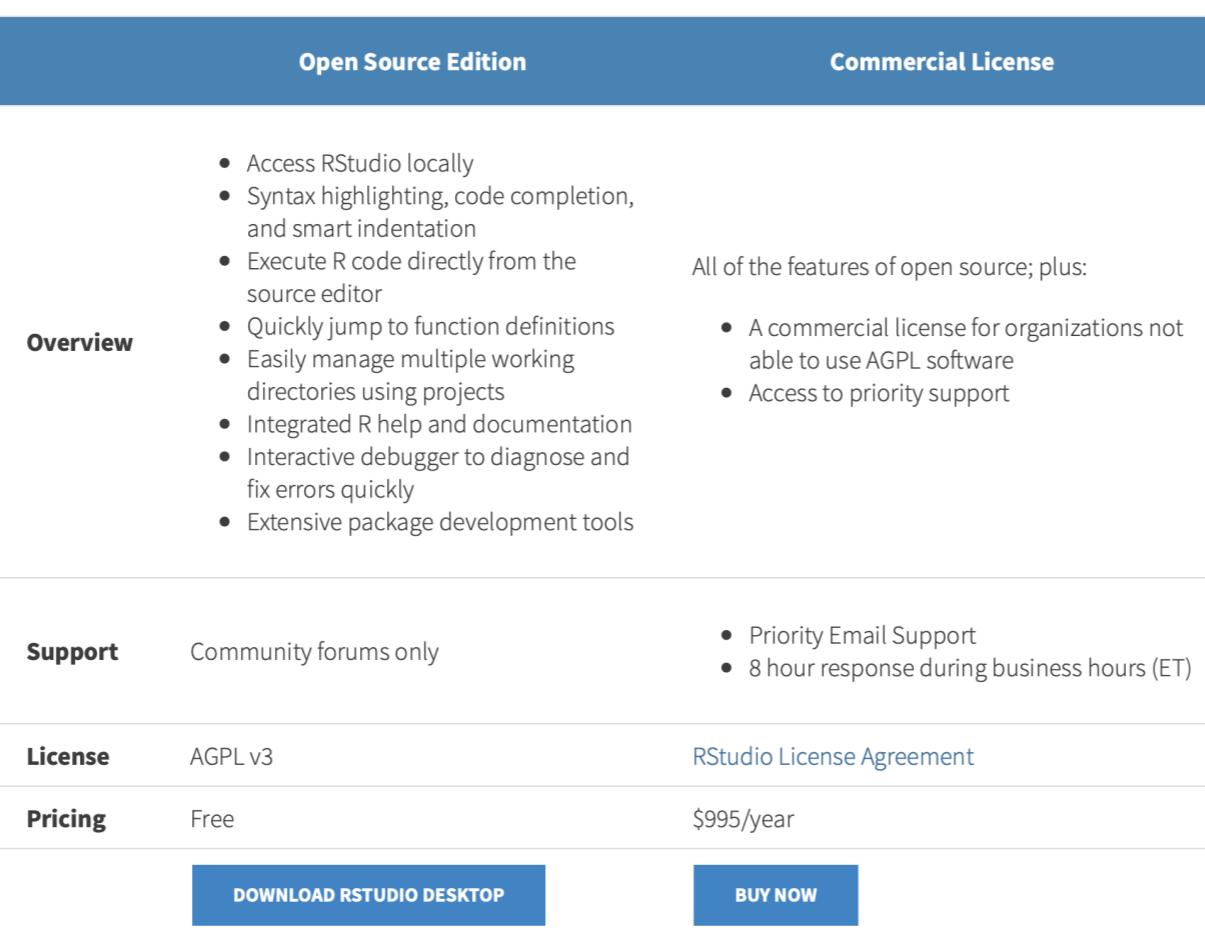
INSTALLING R ON THE MAC — RSTUDIO

Download RStudio Desktop at <https://www.rstudio.com>

1. Look for “Products” → RStudio



2. Scroll down...

A screenshot of the RStudio website's product page. At the top, there are two blue buttons: "Open Source Edition" and "Commercial License". Below them is a section titled "Overview" containing a bulleted list of features for the open source edition. To the right of this is another bulleted list for the commercial license. Further down the page, there are sections for "Support" (community forums only vs. priority email support), "License" (AGPL v3 vs. RStudio License Agreement), and "Pricing" (free vs. \$995/year). At the bottom are two blue buttons: "DOWNLOAD RSTUDIO DESKTOP" and "BUY NOW".

Overview	
• Access RStudio locally	
• Syntax highlighting, code completion, and smart indentation	
• Execute R code directly from the source editor	All of the features of open source; plus:
• Quickly jump to function definitions	• A commercial license for organizations not able to use AGPL software
• Easily manage multiple working directories using projects	• Access to priority support
• Integrated R help and documentation	
• Interactive debugger to diagnose and fix errors quickly	
• Extensive package development tools	

Support	
Community forums only	• Priority Email Support
	• 8 hour response during business hours (ET)

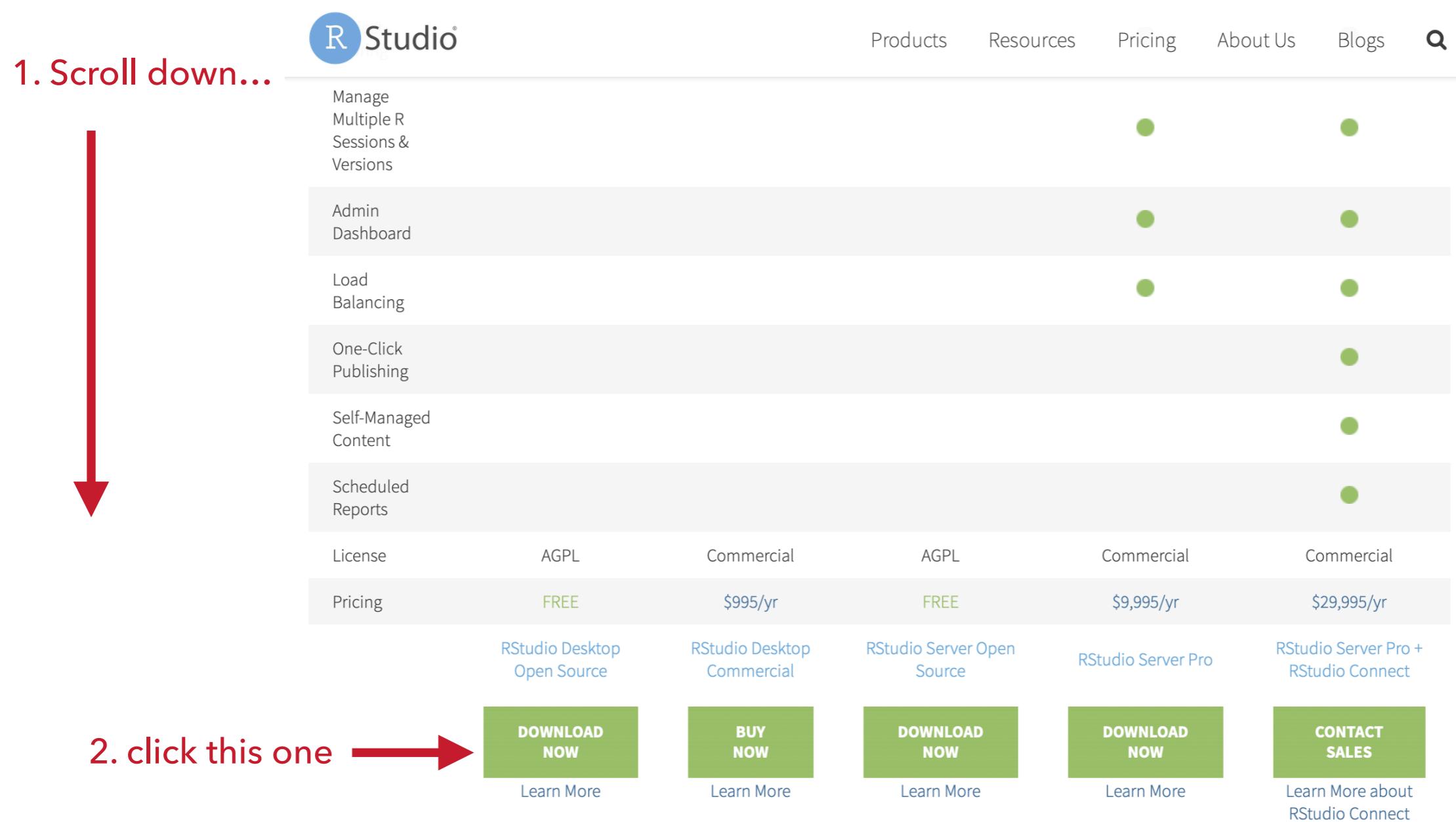
License	
AGPL v3	RStudio License Agreement

Pricing	
Free	\$995/year

3. Then click this ↑

INSTALLING R ON THE MAC — RSTUDIO

Download RStudio Desktop at <https://www.rstudio.com>



The screenshot shows the RStudio website's main navigation bar with links for Products, Resources, Pricing, About Us, and Blogs. Below the navigation is a sidebar with links for managing multiple R sessions, an admin dashboard, load balancing, one-click publishing, self-managed content, and scheduled reports. At the bottom, there are six download options for different products: RStudio Desktop Open Source (FREE), RStudio Desktop Commercial (\$995/yr), RStudio Server Open Source (FREE), RStudio Server Pro (\$9,995/yr), RStudio Server Pro + RStudio Connect (\$29,995/yr), and a Contact Sales button for RStudio Connect.

1. Scroll down...

2. click this one → 

Product	License	Pricing	Commercial	AGPL	Commercial	Commercial
RStudio Desktop Open Source	FREE	\$995/yr	FREE	\$9,995/yr	\$29,995/yr	
RStudio Desktop Commercial						
RStudio Server Open Source						
RStudio Server Pro						
RStudio Server Pro + RStudio Connect						

Products **Resources** **Pricing** **About Us** **Blogs** 

Manage Multiple R Sessions & Versions

Admin Dashboard

Load Balancing

One-Click Publishing

Scheduled Reports

Self-Managed Content

RStudio Desktop Open Source

RStudio Desktop Commercial

RStudio Server Open Source

RStudio Server Pro

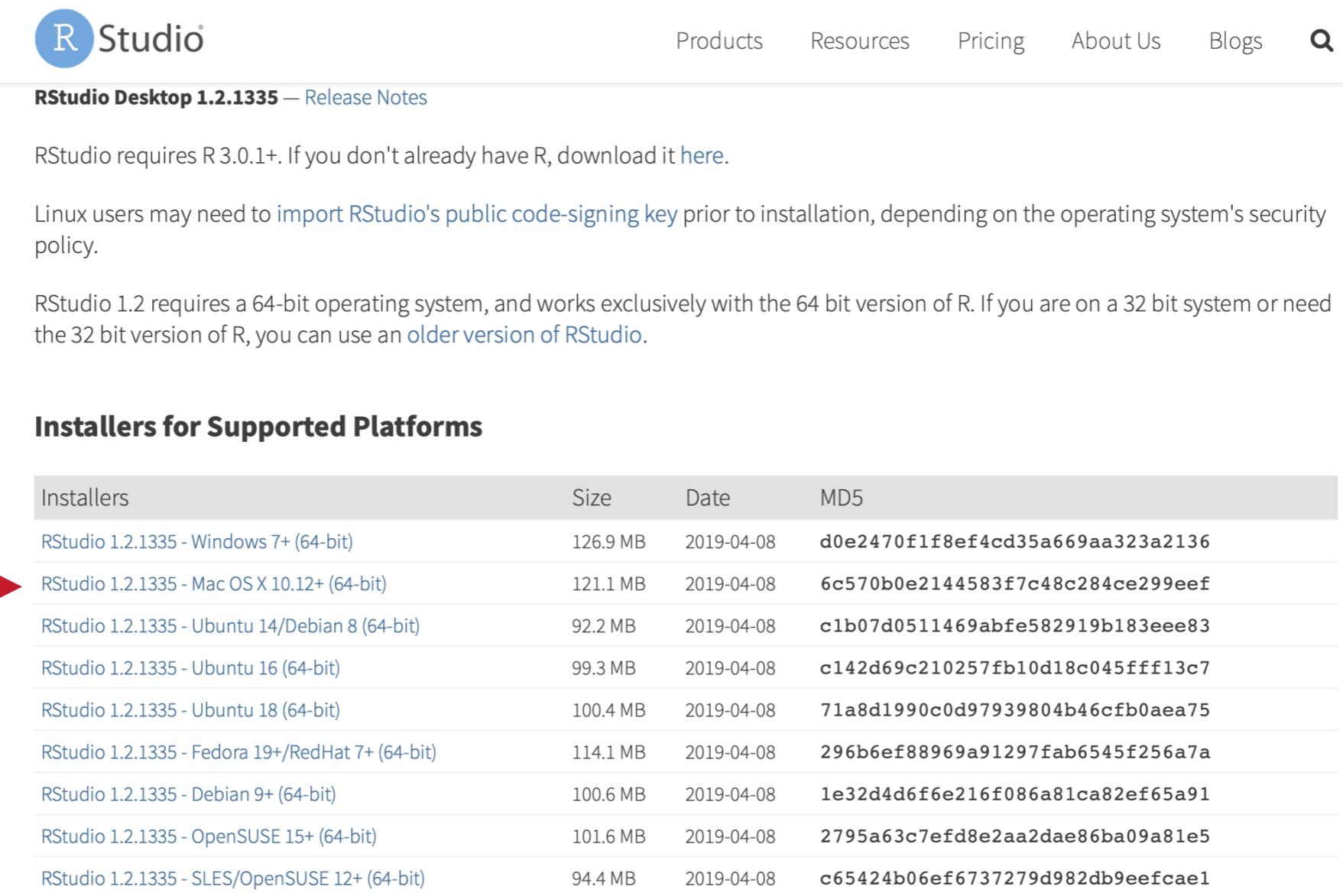
RStudio Server Pro + RStudio Connect

CONTACT SALES

Learn More about RStudio Connect

INSTALLING R ON THE MAC — RSTUDIO

Download RStudio Desktop, and install package as usual



R Studio

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RStudio Desktop 1.2.1335 — Release Notes

RStudio requires R 3.0.1+. If you don't already have R, download it [here](#).

Linux users may need to [import RStudio's public code-signing key](#) prior to installation, depending on the operating system's security policy.

RStudio 1.2 requires a 64-bit operating system, and works exclusively with the 64 bit version of R. If you are on a 32 bit system or need the 32 bit version of R, you can use an [older version of RStudio](#).

Installers for Supported Platforms

Installers	Size	Date	MD5
RStudio 1.2.1335 - Windows 7+ (64-bit)	126.9 MB	2019-04-08	d0e2470f1f8ef4cd35a669aa323a2136
RStudio 1.2.1335 - Mac OS X 10.12+ (64-bit)	121.1 MB	2019-04-08	6c570b0e2144583f7c48c284ce299eef
RStudio 1.2.1335 - Ubuntu 14/Debian 8 (64-bit)	92.2 MB	2019-04-08	c1b07d0511469abfe582919b183eee83
RStudio 1.2.1335 - Ubuntu 16 (64-bit)	99.3 MB	2019-04-08	c142d69c210257fb10d18c045fff13c7
RStudio 1.2.1335 - Ubuntu 18 (64-bit)	100.4 MB	2019-04-08	71a8d1990c0d97939804b46cfb0aea75
RStudio 1.2.1335 - Fedora 19+/RedHat 7+ (64-bit)	114.1 MB	2019-04-08	296b6ef88969a91297fab6545f256a7a
RStudio 1.2.1335 - Debian 9+ (64-bit)	100.6 MB	2019-04-08	1e32d4d6f6e216f086a81ca82ef65a91
RStudio 1.2.1335 - OpenSUSE 15+ (64-bit)	101.6 MB	2019-04-08	2795a63c7efd8e2aa2dae86ba09a81e5
RStudio 1.2.1335 - SLES/OpenSUSE 12+ (64-bit)	94.4 MB	2019-04-08	c65424b06ef6737279d982db9eefcae1

Choose the
Mac one 

INSTALLING R ON THE MAC — SOME NOTES

- ▶ We installed the Xcode tools so we can *compile* R packages; some packages require *compilation* in order to be installed
- ▶ Xcode tools has the essential tools, but may not have everything you need depending on the R package you're trying to install
- ▶ An “easy” way to get additional tools is to use *Homebrew*
<https://brew.sh>
more on this later...

WINDOWS INSTRUCTIONS

INSTALLING R ON WINDOWS — THE OVERVIEW

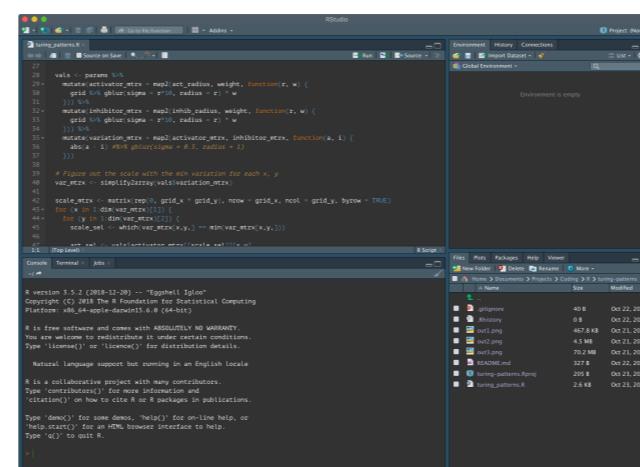
1. Install R



2. Install RTools



3. Install RStudio



A screenshot of the RStudio interface. The top-left pane shows R code in a script editor:

```
27 vals <- params$b$vals
28   # calculate matrix with equal act.radius, weight, function(r, w) {
29   #   grid %>% mutate(mtrx = evalql(act.radius, weight, function(r, w) {
30   #     grid %>% mutate(signe = r^10, radius = r) %>% w
31   #   }))
32   # calculate inhibiting matrix with equal inhib.radius, weight, function(r, w) {
33   #   grid %>% mutate(mtrx = evalql(inhib.radius, weight, function(r, w) {
34   #     grid %>% mutate(signe = r^10, radius = r) %>% w
35   #   }))
36   # calculate variation matrix with equal activated signs, inhibiting mtrx, function(x, t) {
37   #   abs(x - 1) #%% grid$signe * 0.5, radius = 1)
38   # })
39   # figure out the scale with the min variation for each x, y
40   var_mtxr <- simplifyMatrix(vals$variation_mtx)
41   scale_mtxr <- matrix(rep(0, grid_x * grid_y), nrow = grid_x, ncol = grid_y, byrow = TRUE)
42   for (x in 1:grid_x) {
43     for (y in 1:grid_y) {
44       for (z in 1:min(var_mtxr[, y])) {
45         scale_set <- which(var_mtxr[x, y] == min.var_mtxr[x, y], )
46       }
47     }
48   }
49   # now we can calculate the variation matrix with the new scale
50 
```

The top-right pane shows the Global Environment, which is currently empty. The bottom-left pane shows the R console output:

```
R version 3.5.2 (2018-12-20) -- "Eggshell Tinge"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32-v5.0.0 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help,
't?ip.start()' for an HTML browser interface to help.
Type 'q()' to quit R.
```

The bottom-right pane shows the file browser with a list of files in the current directory:

Name	Size	Modified
eggshell.Rproj	0 B	Oct 22, 2018
eggshell	0 B	Oct 22, 2018
eggshell.Rproj	467.8 K	Oct 21, 2018
eggshell.png	4.1 MB	Oct 21, 2018
eggshell2.png	29.2 MB	Oct 22, 2018
eggshell3.png	1.3 MB	Oct 22, 2018
turing.patterns.Rproj	205 B	Oct 23, 2018
turing.patterns.R	2.6 KB	Oct 23, 2018

INSTALLING R ON WINDOWS — R

Install R at <https://www.r-project.org>



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INSTALLING R ON WINDOWS — R

Choose a mirror

CRAN Mirrors

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0-Cloud

This is a good choice

<https://cloud.r-project.org/>



<http://cloud.r-project.org/>

Automatic redirection to servers worldwide, currently sponsored by Rstudio

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Algeria

<https://cran.usthb.dz/>

<http://cran.usthb.dz/>

University of Science and Technology Houari Boumediene

University of Science and Technology Houari Boumediene

Argentina

<http://mirror.fcaglp.unlp.edu.ar/CRAN/>

Universidad Nacional de La Plata

Australia

<https://cran.csiro.au/>

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INSTALLING R ON WINDOWS — R

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The Comprehensive R Archive Network

Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

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- [Download R for Windows](#) 

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

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INSTALLING R ON WINDOWS — R

Download the base package and install as usual



[CRAN
Mirrors](#)
[What's new?](#)
[Task Views](#)
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About R
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[The R Journal](#)

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

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[Manuals](#)
[FAQs](#)
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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](#)
[Rtools](#)

Binaries of contributed CRAN packages for outdated versions of R (for R < 2.13.x; managed by Uwe Ligges).

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 ON WINDOWS — RTOOLS

Get back to this page, and select Rtools this time



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

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

[Software](#)
[R Sources](#)
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[Documentation](#)
[Manuals](#)
[FAQs](#)
[Contributed](#)

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). |
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INSTALLING R ON WINDOWS — RTOOLS

Download and install the “recommended” one



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Building R for Windows

This document is a collection of resources for building packages for R under Microsoft Windows, or for building R itself (version 1.9.0 or later). The original collection was put together by Prof. Brian Ripley and Duncan Murdoch; it is currently maintained by Jeroen Ooms.

The authoritative source of information for tools to work with the current release of R is the "R Administration and Installation" manual. In particular, please read the ["Windows Toolset" appendix](#).

Rtools Downloads

Some of the tools are incompatible with obsolete versions of R. We maintain one actively updated version of the tools, and other "frozen" snapshots of them. We recommend that users use the latest release of Rtools with the latest release of R.

The current version of this file is recorded here: [VERSION.txt](#).

Download	R compatibility	Frozen?
Rtools40 (experimental)	Special R-testing build only, see documentation	-
Rtools35.exe (recommended)	R 3.3.x and later	No
Rtools34.exe	R 3.3.x and later	Yes
Rtools33.exe	R 3.2.x to 3.3.x	Yes
Rtools32.exe	R 3.1.x to 3.2.x	Yes
Rtools31.exe	R 3.0.x to 3.1.x	Yes
Rtools30.exe	R > 2.15.1 to R 3.0.x	Yes
Rtools215.exe	R > 2.14.1 to R 2.15.1	Yes
Rtools214.exe	R 2.13.x or R 2.14.x	Yes
Rtools213.exe	R 2.13.x	Yes

Version number could be different in the future

INSTALLING R ON WINDOWS — RSTUDIO

Follow the same path as of the Mac, but choose the Windows version

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RStudio Desktop 1.2.1335 — Release Notes

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Installers	Size	Date	MD5
RStudio 1.2.1335 - Windows 7+ (64-bit)	126.9 MB	2019-04-08	d0e2470f1f8ef4cd35a669aa323a2136
RStudio 1.2.1335 - Mac OS X 10.12+ (64-bit)	121.1 MB	2019-04-08	6c570b0e2144583f7c48c284ce299eef
RStudio 1.2.1335 - Ubuntu 14/Debian 8 (64-bit)	92.2 MB	2019-04-08	c1b07d0511469abfe582919b183eee83
RStudio 1.2.1335 - Ubuntu 16 (64-bit)	99.3 MB	2019-04-08	c142d69c210257fb10d18c045fff13c7
RStudio 1.2.1335 - Ubuntu 18 (64-bit)	100.4 MB	2019-04-08	71a8d1990c0d97939804b46cfb0aea75
RStudio 1.2.1335 - Fedora 19+/RedHat 7+ (64-bit)	114.1 MB	2019-04-08	296b6ef88969a91297fab6545f256a7a
RStudio 1.2.1335 - Debian 9+ (64-bit)	100.6 MB	2019-04-08	1e32d4d6f6e216f086a81ca82ef65a91
RStudio 1.2.1335 - OpenSUSE 15+ (64-bit)	101.6 MB	2019-04-08	2795a63c7efd8e2aa2dae86ba09a81e5
RStudio 1.2.1335 - SLES/OpenSUSE 12+ (64-bit)	94.4 MB	2019-04-08	c65424b06ef6737279d982db9eefcae1

Choose the → Windows one

INSTALLING R ON WINDOWS — SOME NOTES

- ▶ Like Xcode on the Mac, we installed RTools for Windows so that we can compile R packages that require it
- ▶ If you try to install an R package that needs compilation, a dialog box should pop-up asking if you want to use RTools to get the job done... be on the look out

NEXT STEPS

AFTER INSTALLATION...

- ▶ Launch the RStudio application
- ▶ It should pick-up your installation of R, and you should be ready to go
- ▶ If not, you'll get a warning message saying that you need to install R
- ▶ You can start installing packages in RStudio via:
Tools → Install packages...

NOTES ABOUT PACKAGE INSTALLATION

- ▶ Lots of packages have “binary” versions, which mean they should just install with no problems
- ▶ Some package require compilation – this is why we installed Xcode tools / RTools
- ▶ Sometimes package compilation doesn’t work, and this can be really frustrating!!!
- ▶ Check the R Console window for any messages... there might be A LOT of text to scroll through

NOTES ABOUT PACKAGE INSTALLATION

This is an example error message that is actually useful

```
...
Using PKG_CFLAGS=
Using PKG_LIBS=-lxml2
----- ANTICONF ERROR -----
Configuration failed because libxml-2.0 was not found. Try installing:
 * deb: libxml2-dev (Debian, Ubuntu, etc)
 * rpm: libxml2-devel (Fedora, CentOS, RHEL)
 * csw: libxml2_dev (Solaris)
If libxml-2.0 is already installed, check that 'pkg-config' is in your
PATH and PKG_CONFIG_PATH contains a libxml-2.0.pc file. If pkg-config
is unavailable you can set INCLUDE_DIR and LIB_DIR manually via:
R CMD INSTALL --configure-vars='INCLUDE_DIR=... LIB_DIR=...'

----- ERROR -----
ERROR: configuration failed for package 'xml2'
* removing '/usr/local/lib/R/site-library/xml2'
ERROR: dependency 'xml2' is not available for package 'tm'
* removing '/usr/local/lib/R/site-library/tm'

The downloaded source packages are in
  '/tmp/RtmpLb48pu/downloaded_packages'
Warning messages:
1: In install.packages("tm") :
  installation of package 'xml2' had non-zero exit status
2: In install.packages("tm") :
  installation of package 'tm' had non-zero exit status
```

We need the
libxml-2.0 library

Installation
suggestions are
noted

NOTES ABOUT PACKAGE INSTALLATION

- ▶ If you still have problems, grab a piece of text in the Console output and Google it...
- ▶ This can be frustrating... hopefully Google will be your friend

NOTES ABOUT UPGRADING R

- ▶ Once you have R and RStudio installed, there may come a time when you want to update to a new version
- ▶ RStudio
 - ▶ You can (typically) just install a new version over the top of the old version, just follow the same steps as before
 - ▶ This won't affect your current R installation/version
- ▶ R
 - ▶ You can (typically) just install a new version over the top of the old version, just follow the same steps as before
 - ▶ IMPORTANT: for major R releases, you'll need to reinstall your packages; if you have critical work to do, you might consider waiting a bit before upgrading R (let packages get updated, bugs worked out, etc)