

Foundation of Machine Learning

CSE4032

Lecture 00: Installation guide for R and RStudio

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Outline

- ① Introduction
 - ② Setup independent environment
 - ③ Setup Anaconda environment
 - ④ Start with RStudio
 - ⑤ References

Introduction to R

- R is a free software environment for statistical computing and graphics.
 - R is the most popular language in the world of Data Science.
 - It is heavily used in analyzing data that is both structured and unstructured.
 - This has made R, the standard language for performing statistical operations.
 - R allows various features that set it apart from other Data Science languages.



Why learn R?

- Free and open-source tool
 - Large community of users
 - Latest cutting edge technology
 - Independent platform
 - Gateway to lucrative career
 - Robust visualization library
 - Go to language for Statistics and Data Science
 - Used in almost every industry

Setup R environment

- It compiles and runs on a wide variety of UNIX platforms, Windows, and MacOS.
 - Download the R installer from <https://cran.r-project.org/>
 - Run the installer and keep default settings.
 - Must insure that you have **admin rights**. Without this, you will not be able to install additional packages later.
 - Usually, I prefer two approaches to setup R environment.
 - Independent environment
 - Anaconda environment

From where to download R

- Download the R installer from <https://cran.r-project.org/>



[CRAN](#)
[Mirrors](#)
[What's new?](#)
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[R Homepage](#)
[The R Journal](#)

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

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

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!

- The latest release (2021-02-15, Lost Library Book) [R-4.0.4.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).

From where to download R

- Download the R installer from <https://cran.r-project.org/>



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 $\geq 2.13.x$; 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.

[CRAN
Mirrors](#)

[What's new?](#)

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From where to download R

- Download the R installer from <https://cran.r-project.org/>



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R-4.0.4 for Windows (32/64 bit)

[Download R 4.0.4 for Windows](#) (85 megabytes, 32/64 bit)

[Installation and other instructions](#)
[New features in this version](#)

If you want to double-check that the package you have downloaded matches the package distributed by CRAN, you can compare the [md5sum](#) of the .exe to the [fingerprint](#) on the master server. You will need a version of md5sum for windows: both [graphical](#) and [command line versions](#) are available.

Frequently asked questions

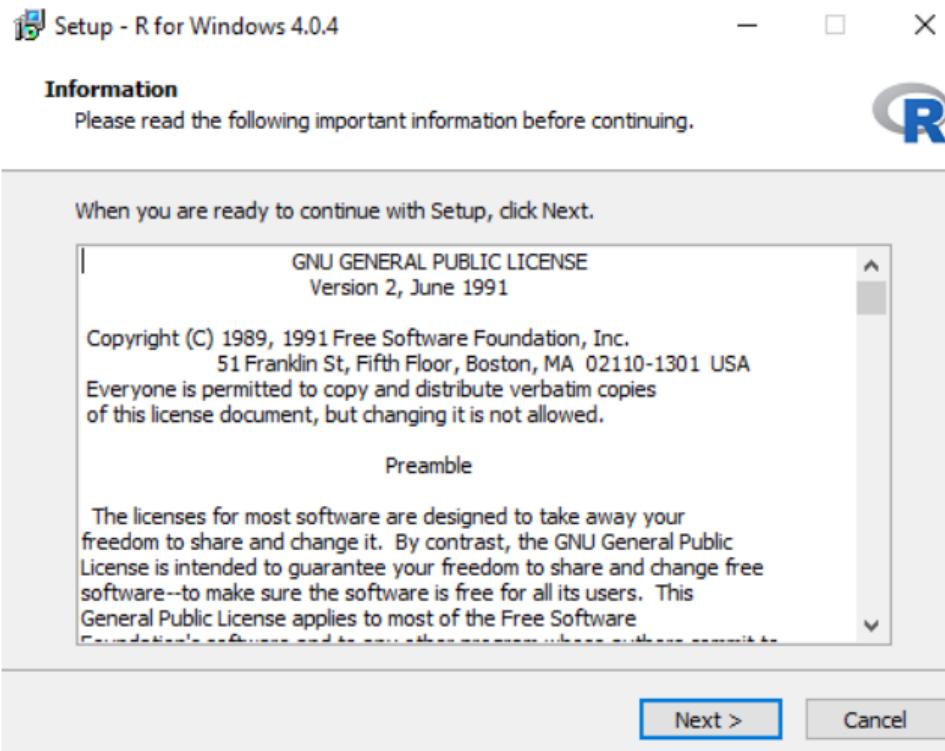
- [Does R run under my version of Windows?](#)
- [How do I update packages in my previous version of R?](#)
- [Should I run 32-bit or 64-bit R?](#)

Please see the [R FAQ](#) for general information about R and the [R Windows FAQ](#) for Windows-specific information.

Other builds

- 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](#).
- [Previous releases](#)

R installation guide

 Setup - R for Windows 4.0.4

Information

Please read the following important information before continuing.

When you are ready to continue with Setup, click Next.

GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

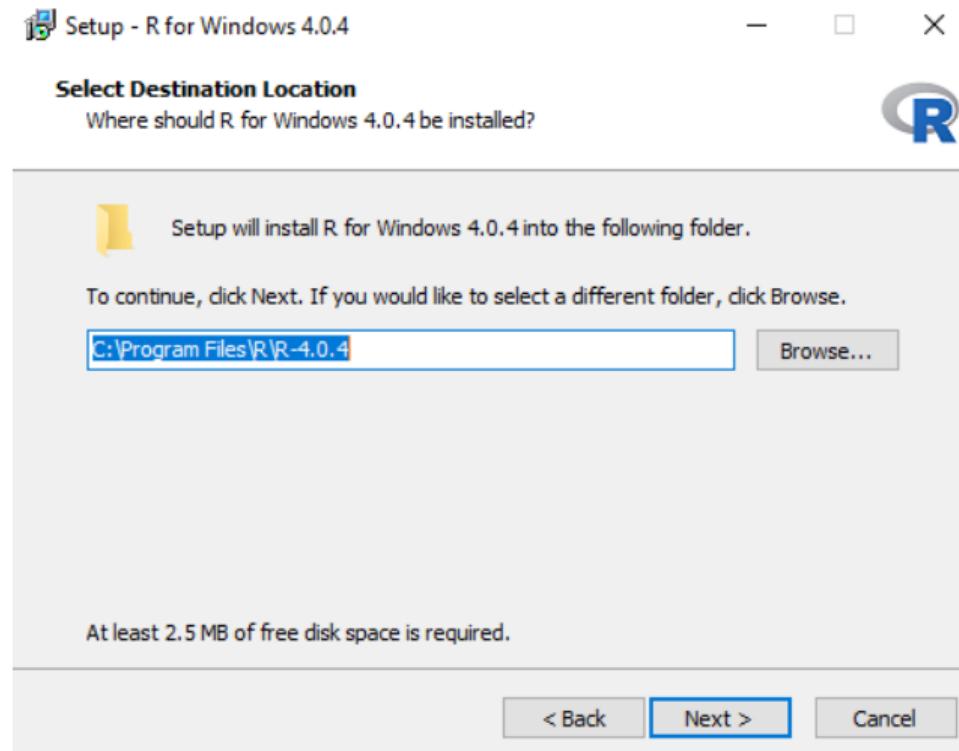
Copyright (C) 1989, 1991 Free Software Foundation, Inc.
51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim copies
of this license document, but changing it is not allowed.

Preamble

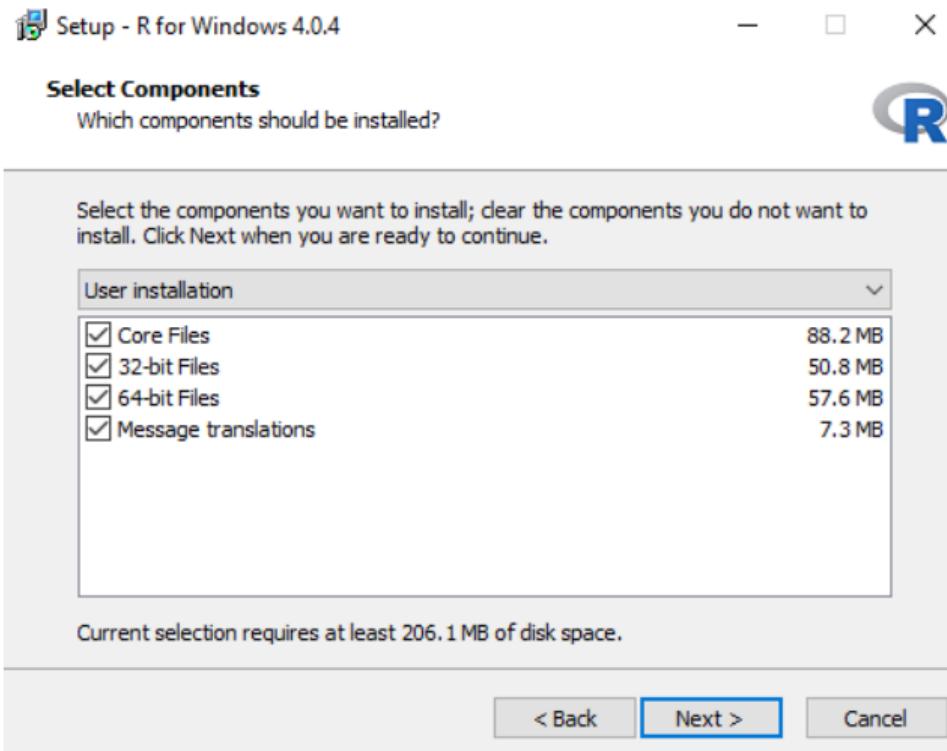
The licenses for most software are designed to take away your
freedom to share and change it. By contrast, the GNU General Public
License is intended to guarantee your freedom to share and change free
software--to make sure the software is free for all its users. This
General Public License applies to most of the Free Software

Next > Cancel

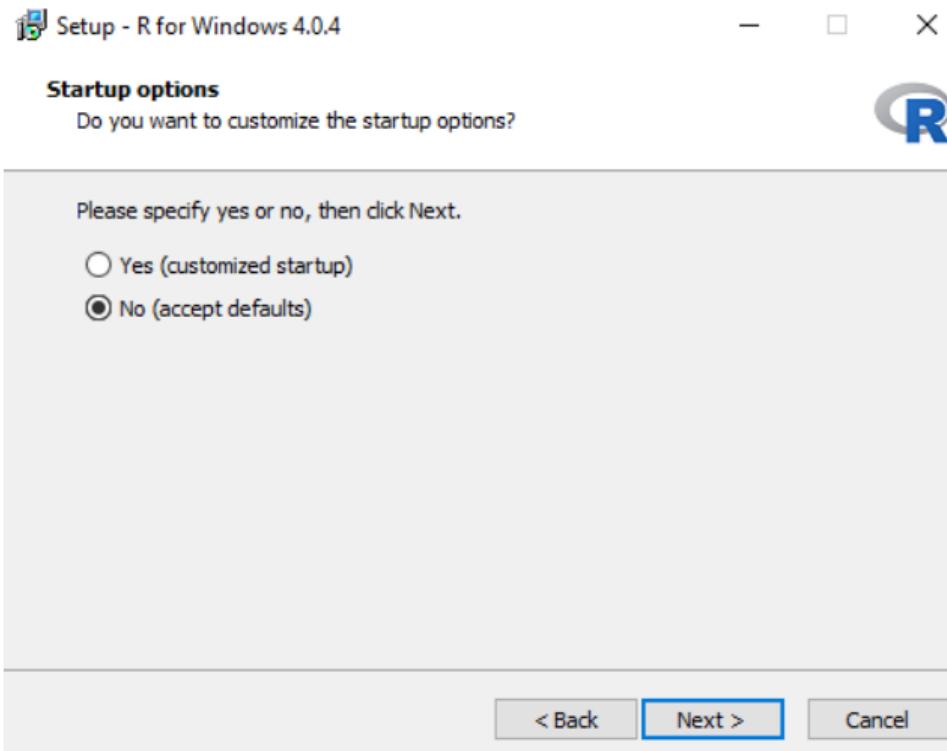
R installation guide



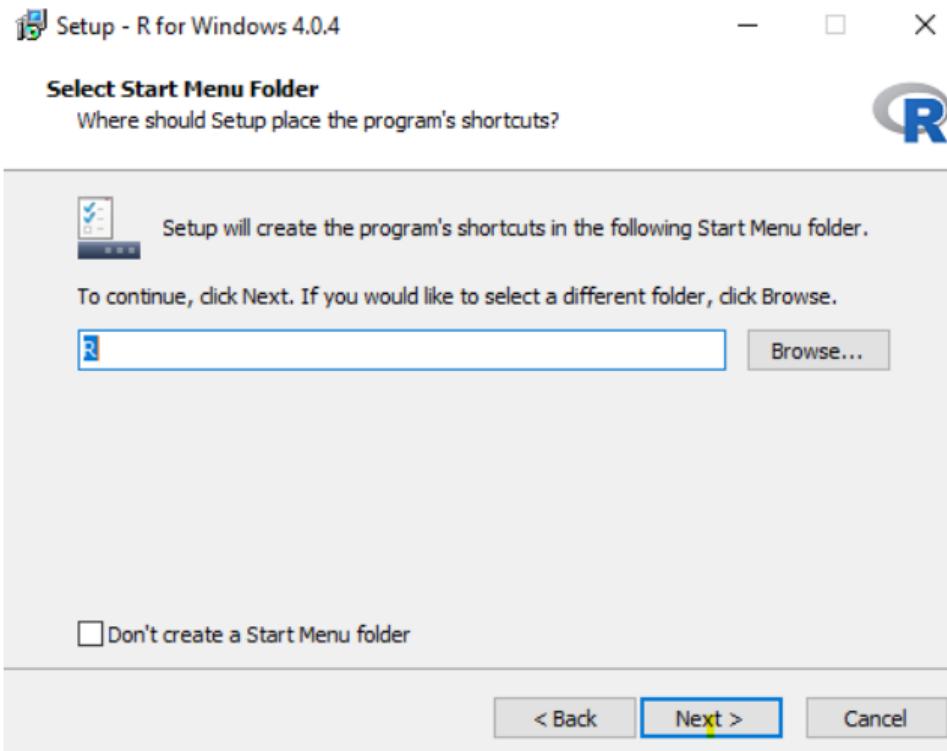
R installation guide



R installation guide



R installation guide



R installation guide



Setup - R for Windows 4.0.4



Select Additional Tasks

Which additional tasks should be performed?



Select the additional tasks you would like Setup to perform while installing R for Windows 4.0.4, then click Next.

Additional shortcuts:

- Create a desktop shortcut
- Create a Quick Launch shortcut

Registry entries:

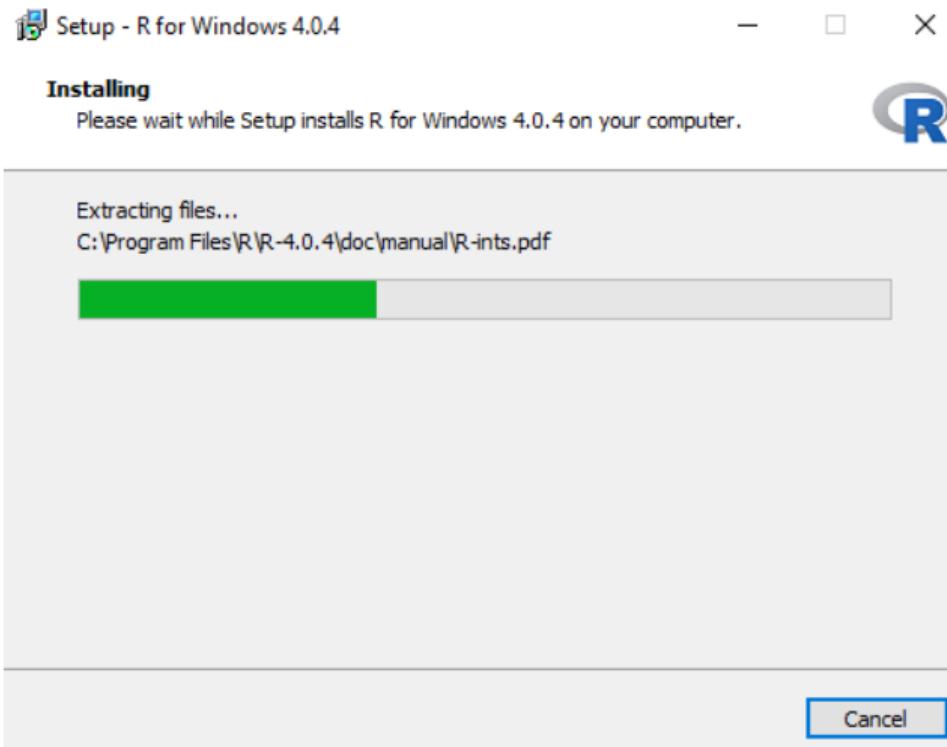
- Save version number in registry
- Associate R with .RData files

< Back

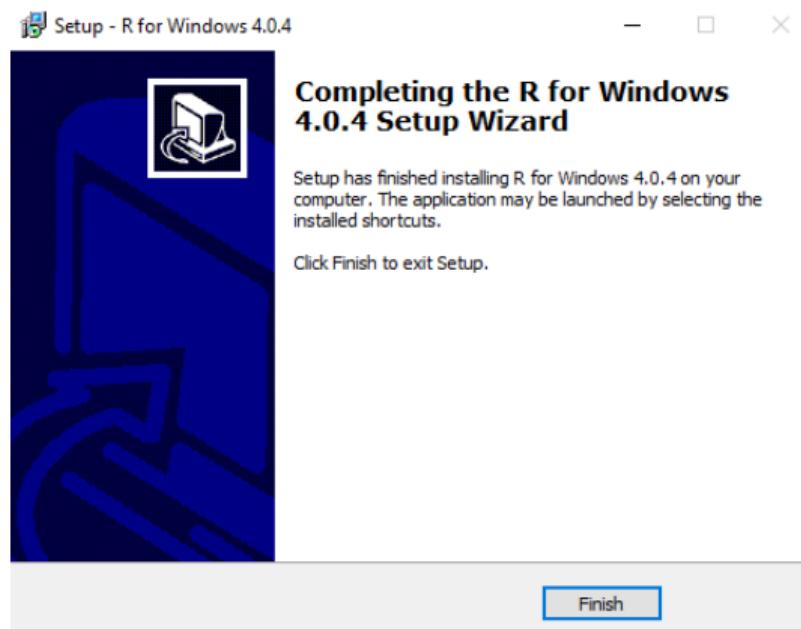
Next >

Cancel

R installation guide



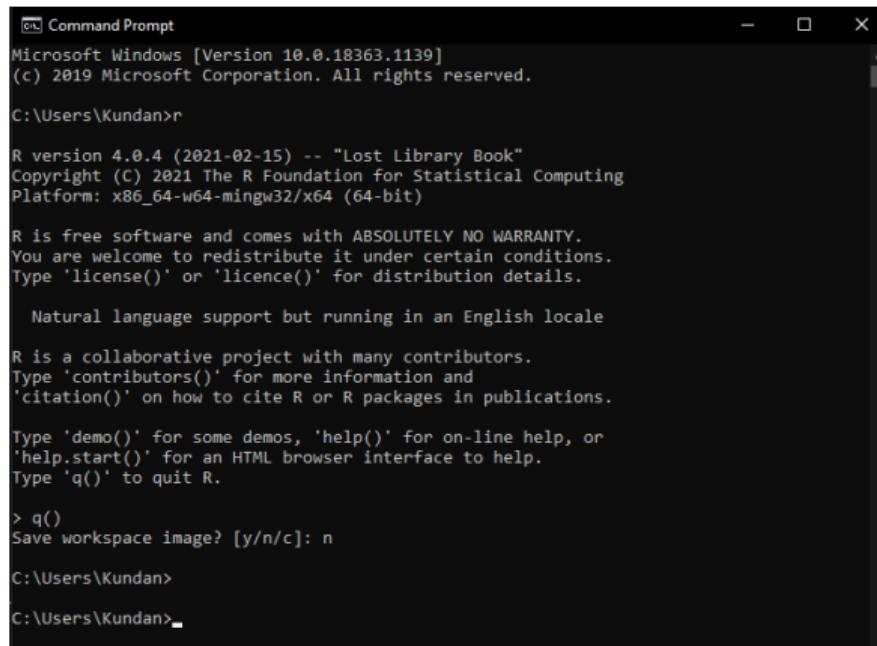
R installation guide



- Don't forget to set the path to use R from command prompt / terminal.

Check R installation

- Type 'r' in Command Prompt to ensure that R is the path.



The screenshot shows a Microsoft Windows Command Prompt window with the title 'Command Prompt'. The window displays the following text:

```
Microsoft Windows [Version 10.0.18363.1139]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Kundan>r

R version 4.0.4 (2021-02-15) -- "Lost Library Book"
Copyright (C) 2021 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (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

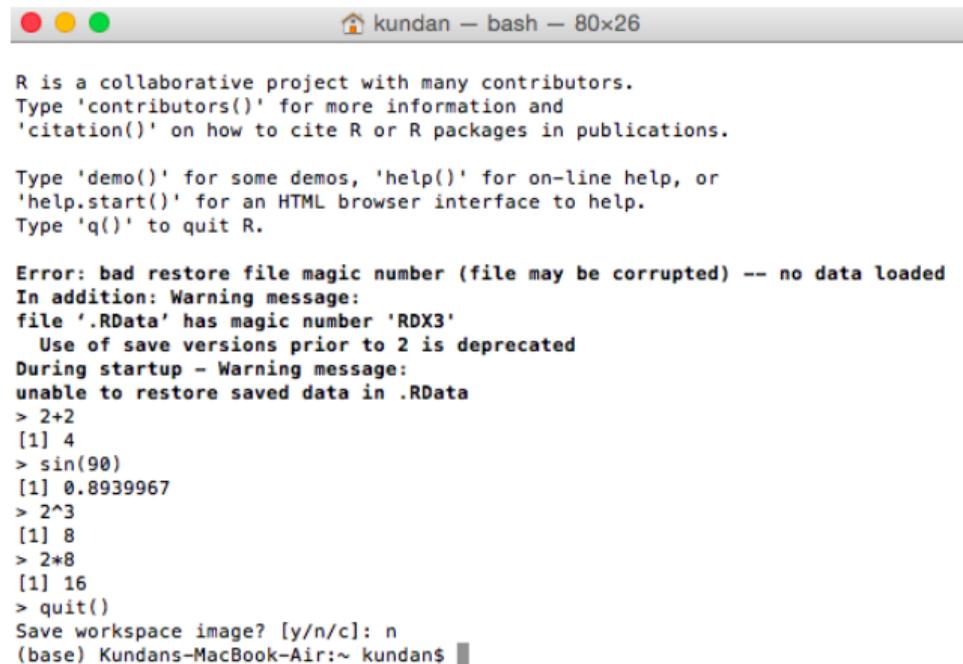
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> q()
Save workspace image? [y/n/c]: n

C:\Users\Kundan>
```

Use R as a calculator



```
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, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

Error: bad restore file magic number (file may be corrupted) -- no data loaded
In addition: Warning message:
file '.RData' has magic number 'RDX3'
  Use of save versions prior to 2 is deprecated
During startup - Warning message:
unable to restore saved data in .RData
> 2+2
[1] 4
> sin(90)
[1] 0.8939967
> 2^3
[1] 8
> 2*8
[1] 16
> quit()
Save workspace image? [y/n/c]: n
(base) Kundans-MacBook-Air:~ kundan$
```

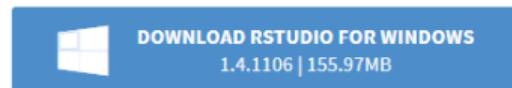
From where to download RStudio

- Download the RStudio installer from

<https://rstudio.com/products/rstudio/download/#download>

RStudio Desktop 1.4.1106 [- Release Notes](#)

1. Install R. RStudio requires R 3.0.1+.
2. Download RStudio Desktop. Recommended for your system:

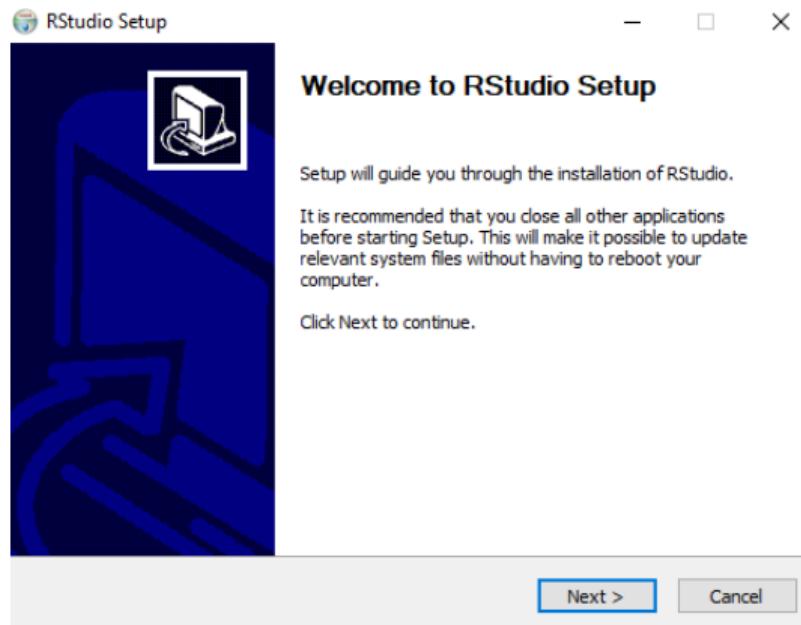


Requires Windows 10/8 (64-bit)

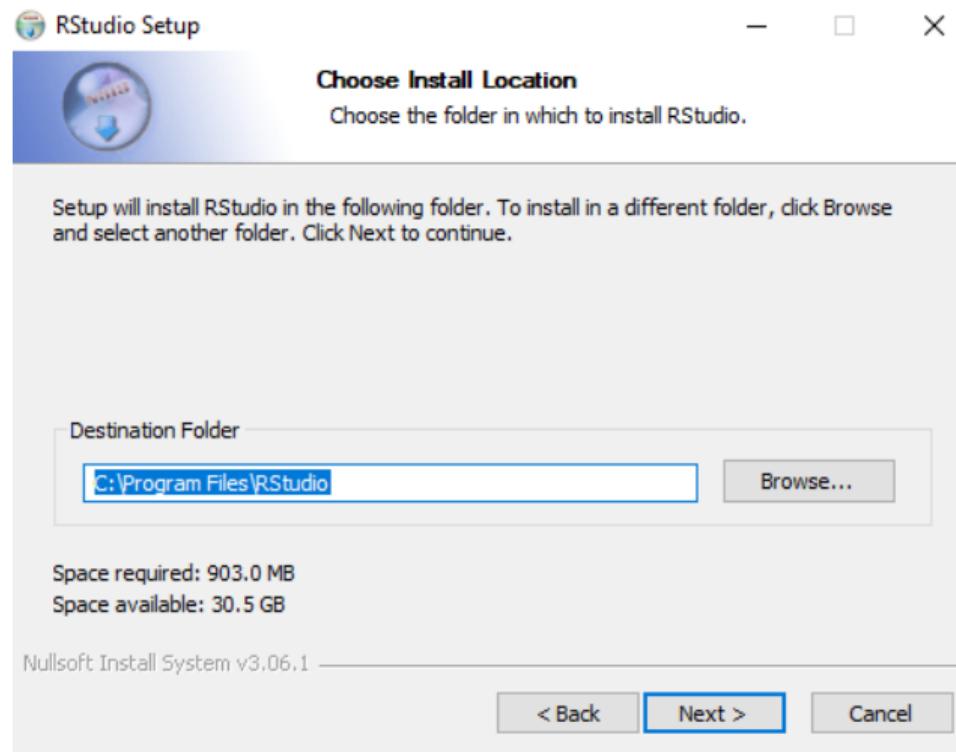


RStudio Installation guide

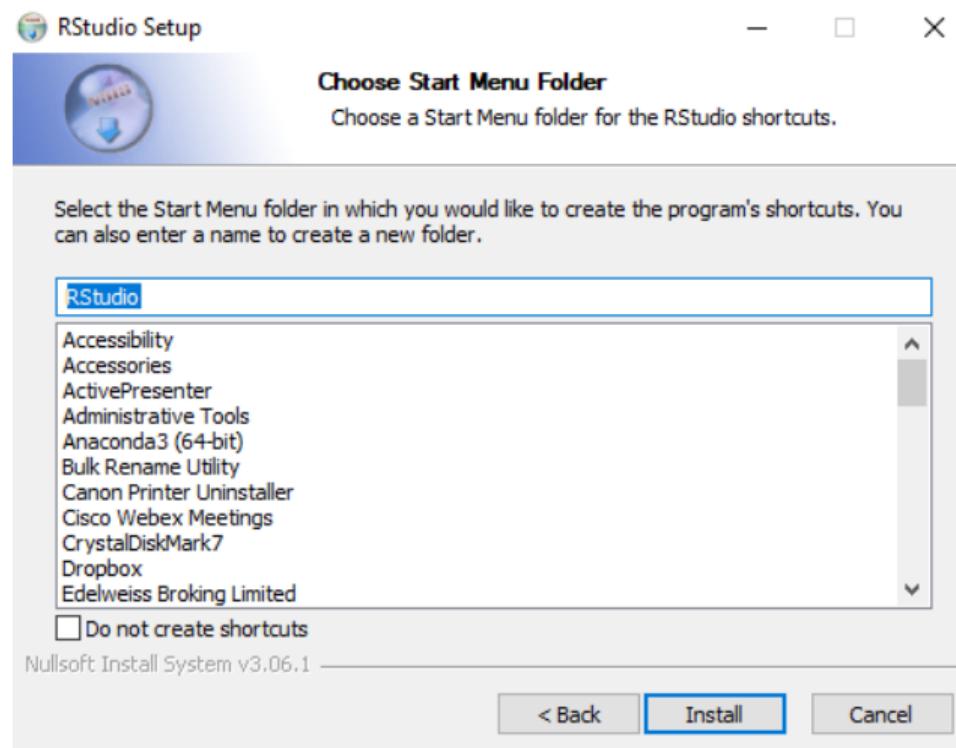
- Run RStudio-1.4.1106.exe as administrator.



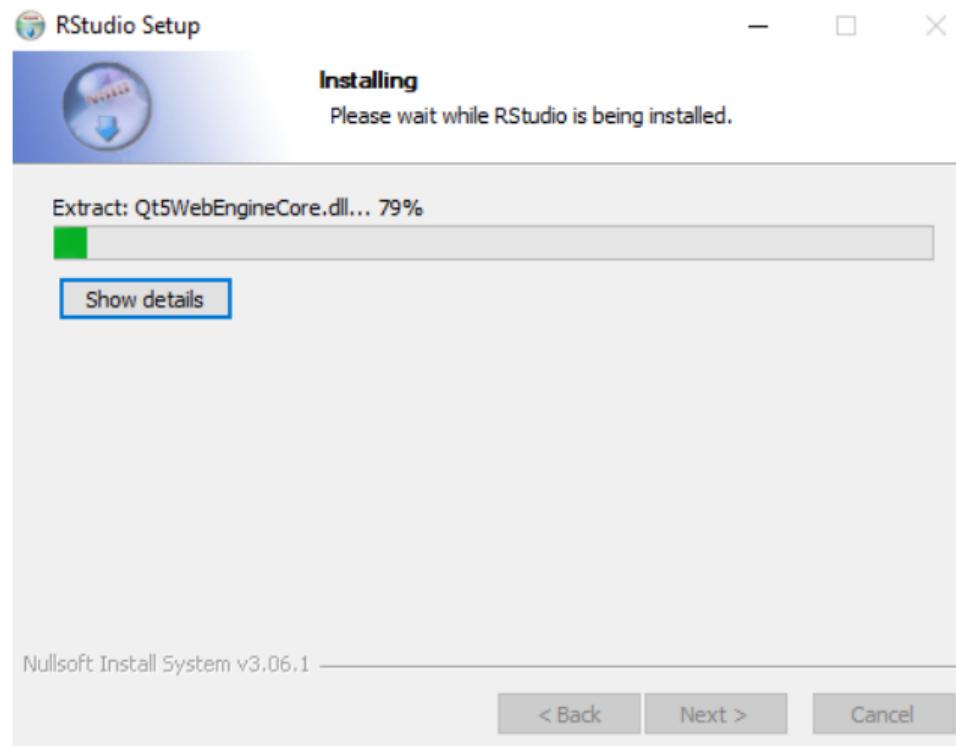
RStudio Installation guide



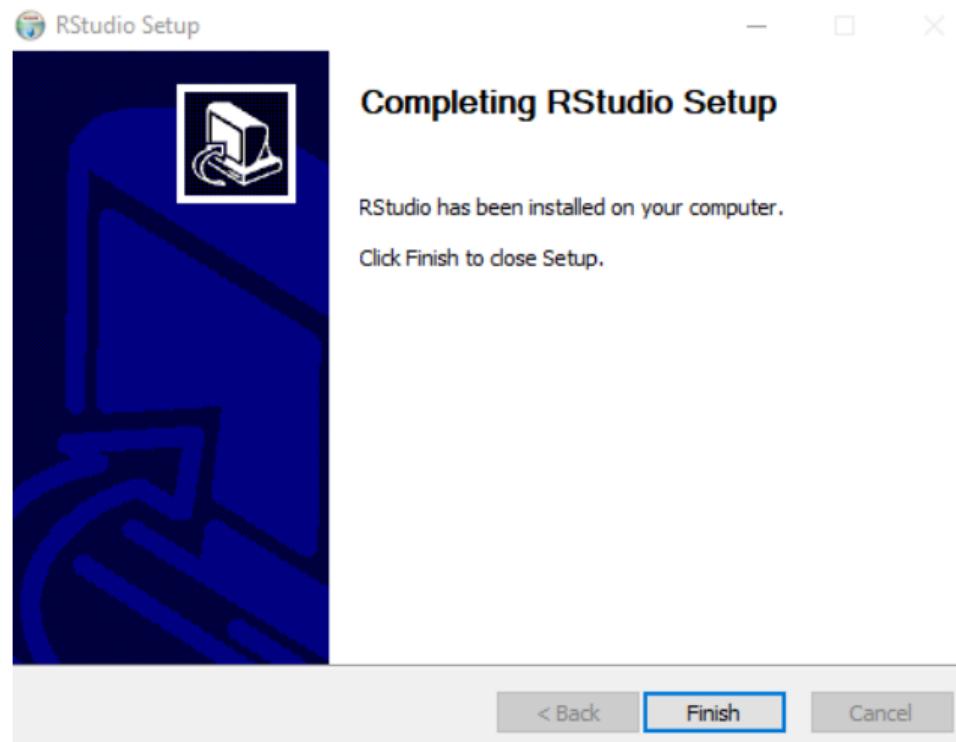
RStudio Installation guide



RStudio Installation guide



RStudio Installation guide



Introduction

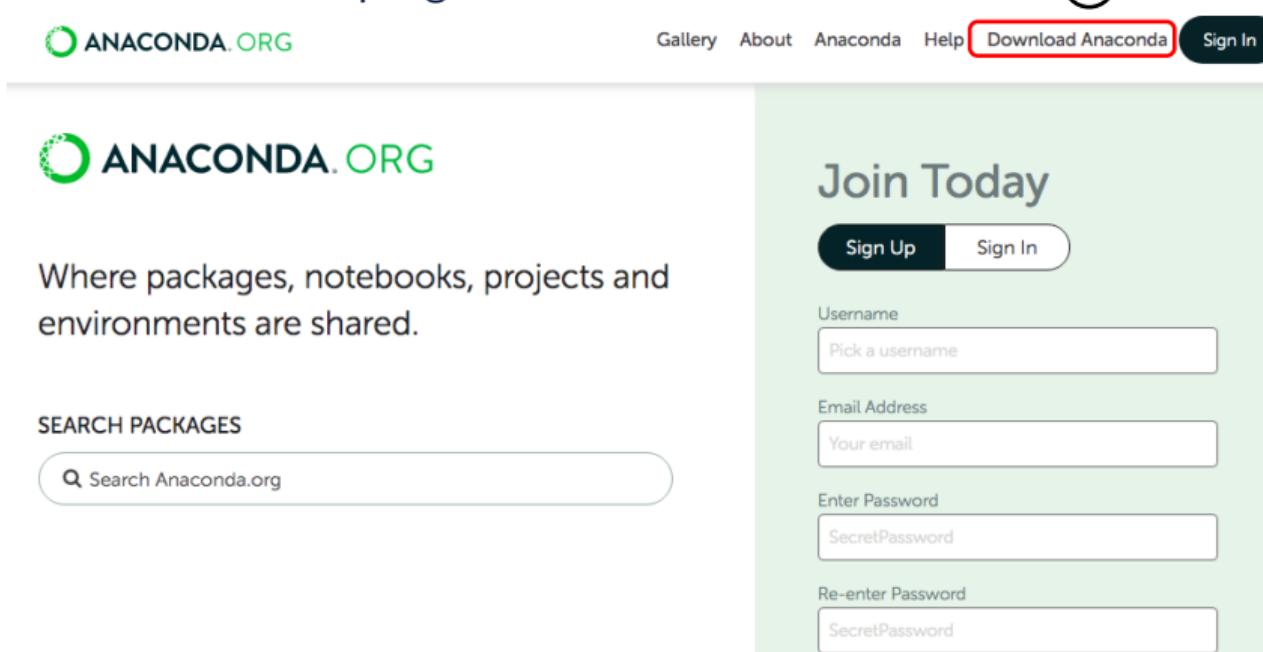
- Anaconda is an open-source distribution for **python** and **R**.



- It is used for
 - data science, data analytic,
 - machine learning,
 - deep learning, etc.
- More than 300 libraries are available for data science.
- Simplified package management and deployment.
- An **easily manageable environment setup** which can deploy any project with the click of a single button.

Where to find Anaconda?

1. Go to website: <https://www.anaconda.org>
2. Click on download on top-right corner and scroll down.



The image shows a screenshot of the Anaconda.org website. At the top, there is a navigation bar with links for 'Gallery', 'About', 'Anaconda', 'Help', 'Download Anaconda' (which is highlighted with a red box and circled '1'), and 'Sign In'. Below the navigation bar, the website's logo 'ANACONDA.ORG' is displayed. A large text area says 'Where packages, notebooks, projects and environments are shared.' Below this, there is a 'SEARCH PACKAGES' section with a search bar containing the placeholder 'Search Anaconda.org'. To the right, there is a 'Join Today' form with fields for 'Username' (placeholder 'Pick a username'), 'Email Address' (placeholder 'Your email'), 'Enter Password' (placeholder 'SecretPassword'), and 'Re-enter Password' (placeholder 'SecretPassword').

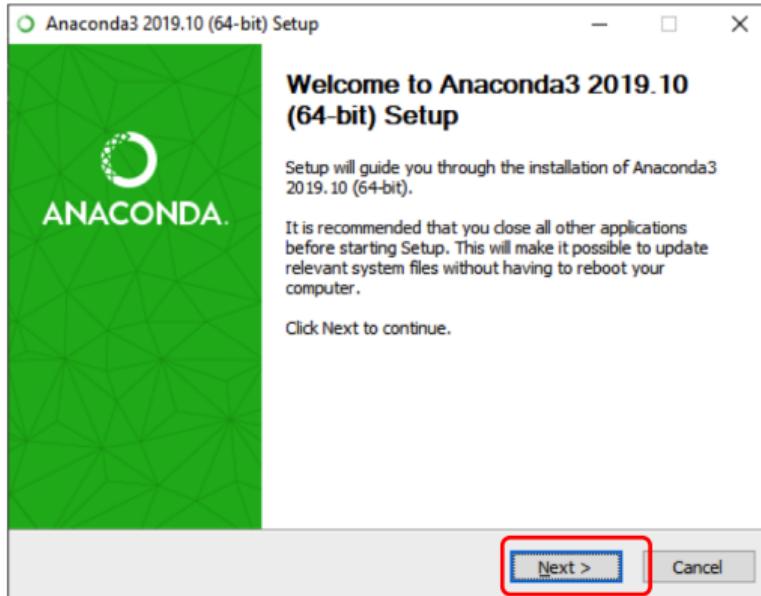
Where to find Anaconda?

3. Scroll down and choose your operating system.
4. Download 64-Bit or 32-Bit Graphical Installer (Python 3.8 version).



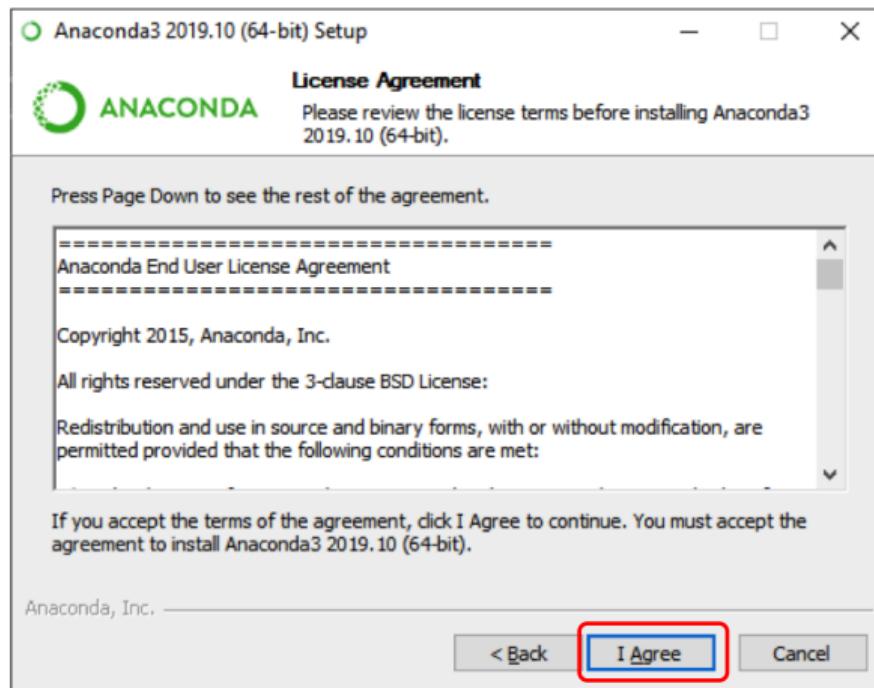
How to install Anaconda?

- In windows, double click the installer to run (you may choose run as Administrator for safe side).
- Click on **Next**.



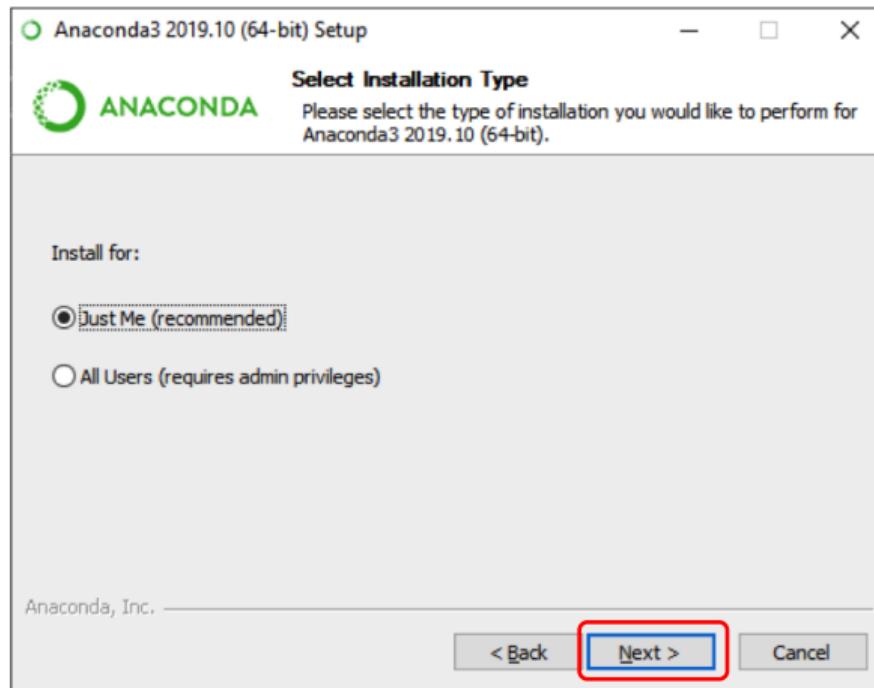
How to install Anaconda?

- Click on I Agree.



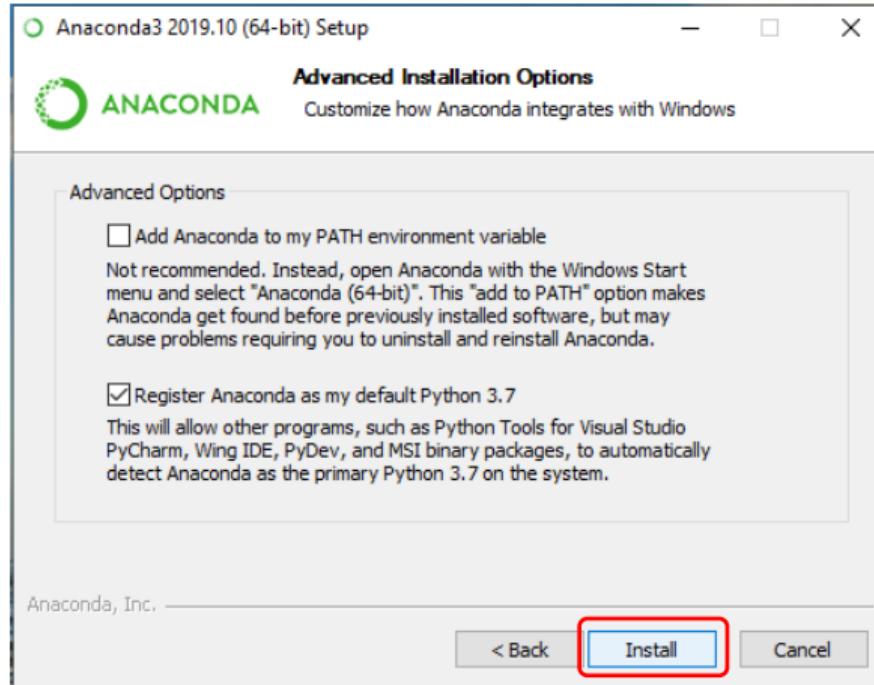
How to install Anaconda?

- Click on **Next**.



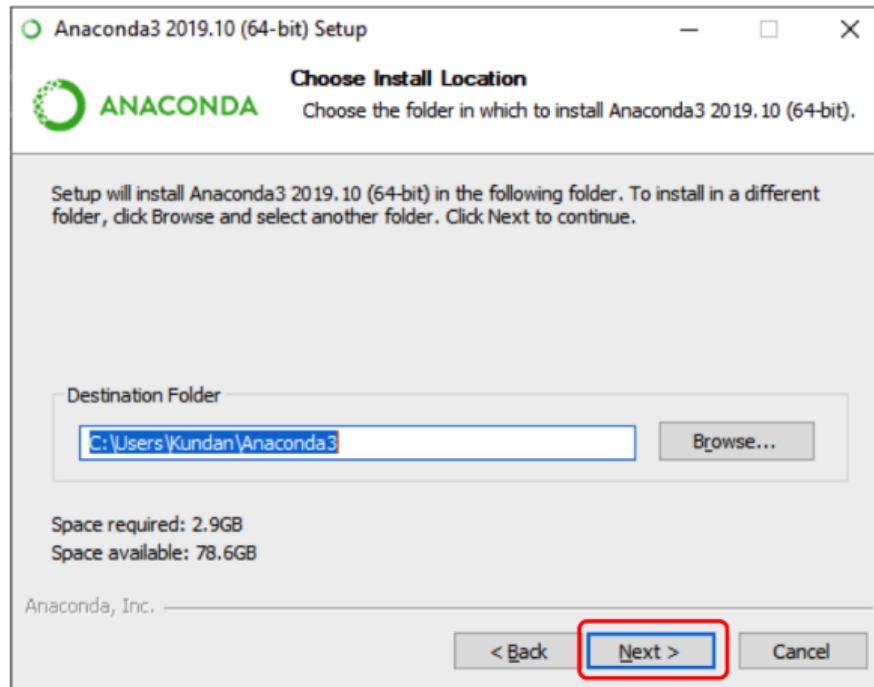
How to install Anaconda?

- Click on **Install**.



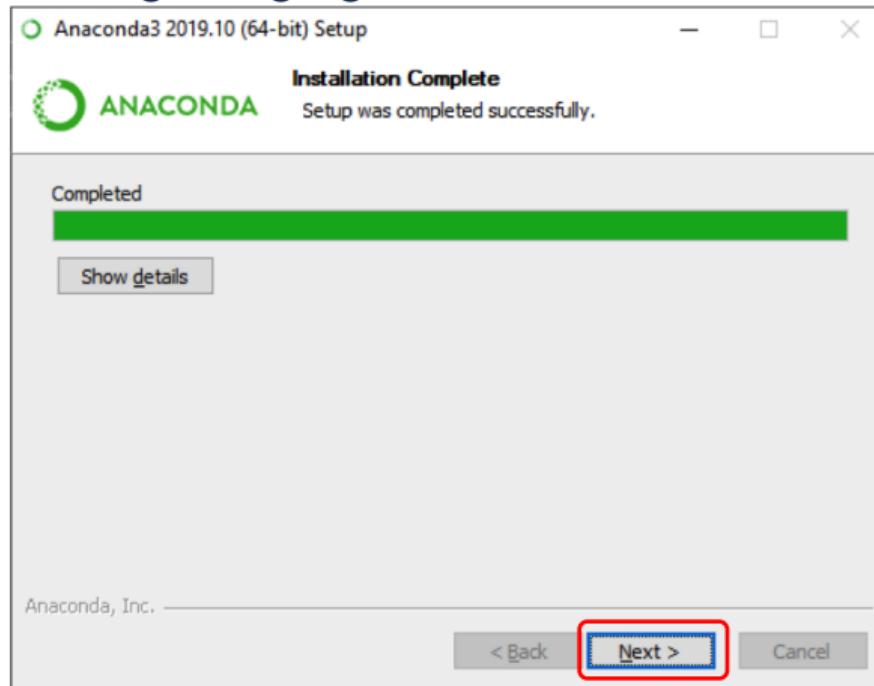
How to install Anaconda?

- Click on **Next**.



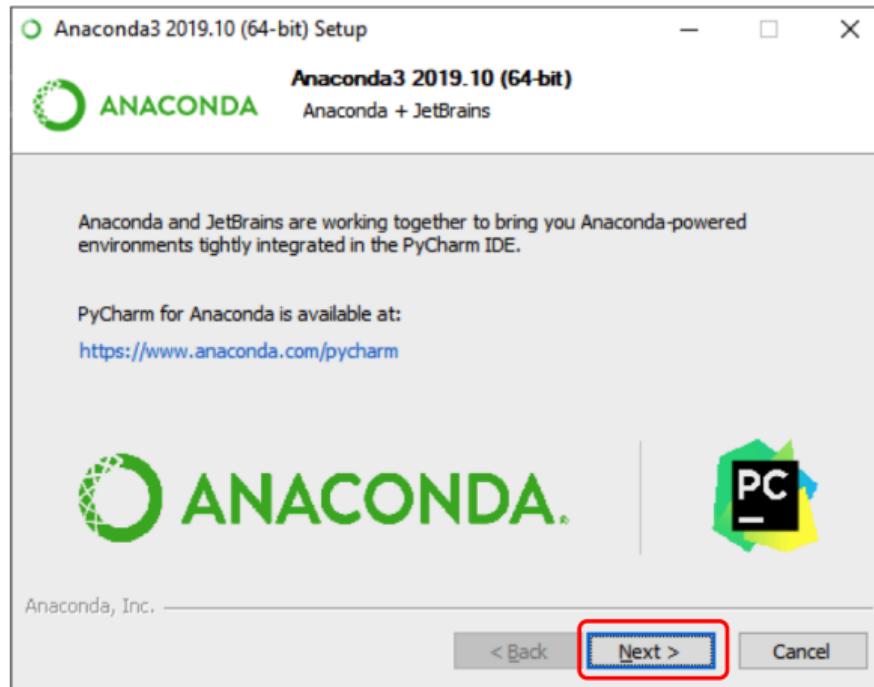
How to install Anaconda?

- Click on **Next**, when it gets highlighted.



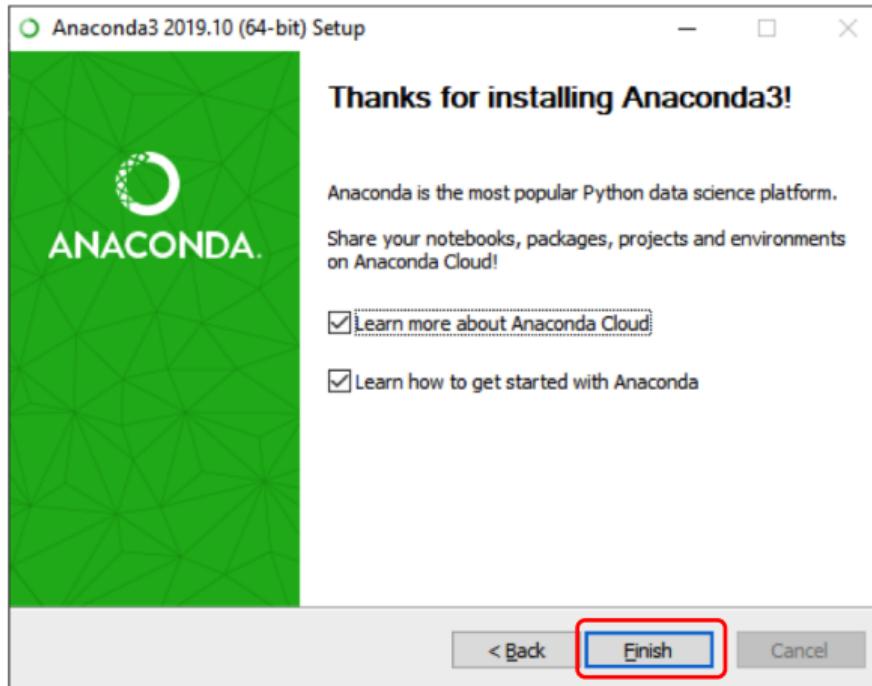
How to install Anaconda?

- Click on **Next**.



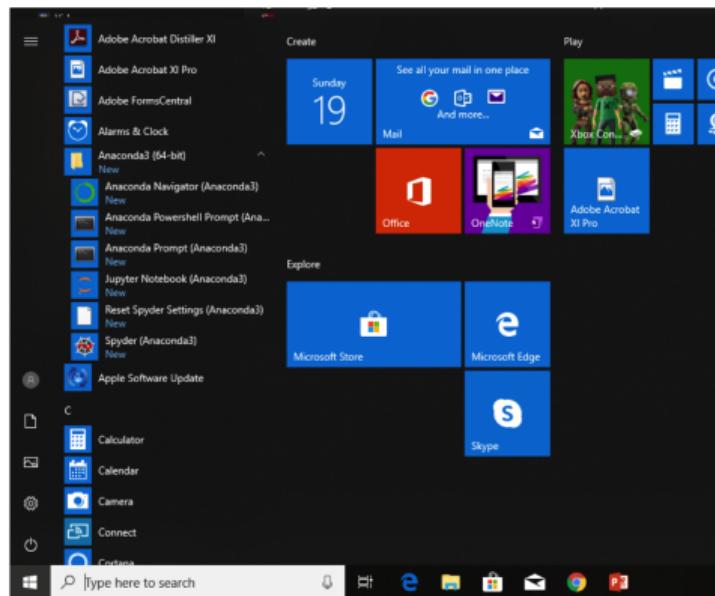
How to install Anaconda?

- Click on **Finish**.



Open Anaconda Powershell Prompt

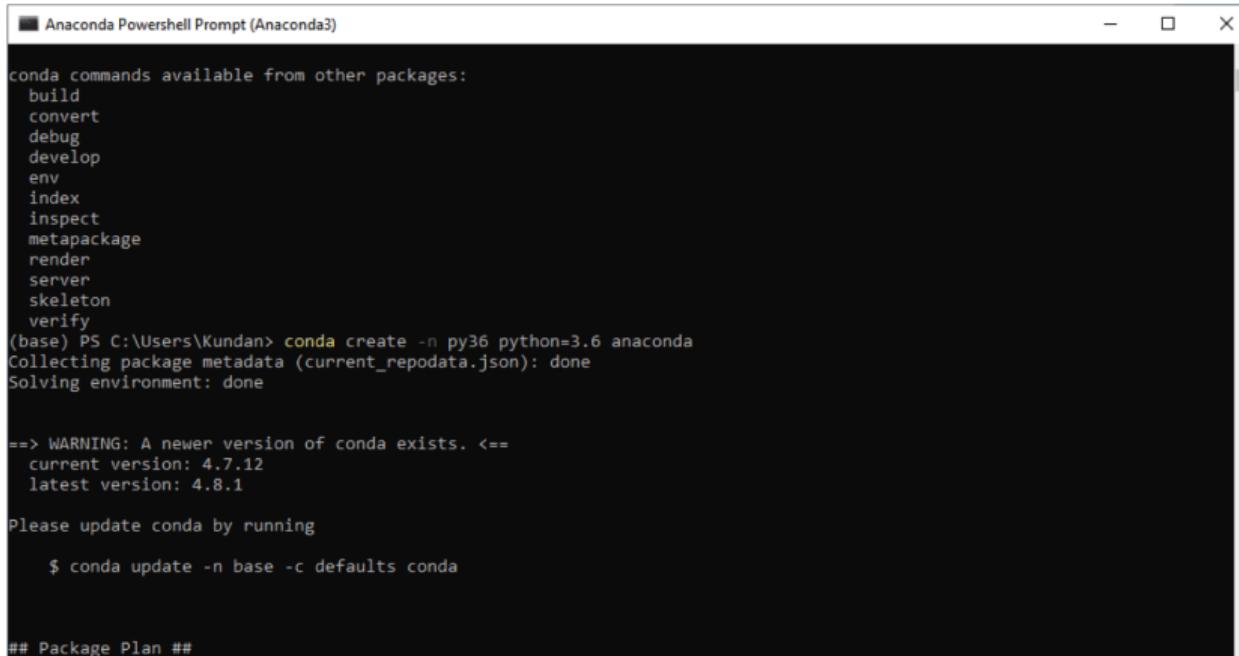
- Go to start (bottom-left corner) and scroll down to find **Anaconda3 (64 bit)**.
- Click on **Anaconda Powershell Promt** to open it.



Check, is anaconda in path?

- In the powershell prompt run “**conda**” to ensure that anaconda is in path.

\$ conda



```
conda commands available from other packages:
  build
  convert
  debug
  develop
  env
  index
  inspect
  metapackage
  render
  server
  skeleton
  verify
(base) PS C:\Users\Kundan> conda create -n py36 python=3.6 anaconda
Collecting package metadata (current_repodata.json): done
Solving environment: done

==> WARNING: A newer version of conda exists. <==
  current version: 4.7.12
  latest version: 4.8.1

Please update conda by running

  $ conda update -n base -c defaults conda

## Package Plan ##
```

How to create a virtual environment for R?

- To create a **virtual environment** for R, run

```
$ conda create -n R4 r-essentials r-base
```

- press **Y** to proceed. Wait for complete the installation.
- After the completion of the installation, activate the virtual environment as

```
$ conda activate R4
```

- Ensure that default environment base is changed to R4.
- To deactivate the environment

```
$ conda deactivate
```

NOTE: You can use up and down key in the keyboard to see command history executed.

How to create a virtual environment for Python?

- To create a **virtual environment** for python, run

```
$ conda create -n py36 python=3.6 anaconda
```

- press **Y** to proceed. Wait for complete the installation.
- After the completion of the installation, activate the virtual environment as

```
$ conda activate py36
```

- Ensure that default environment base is changed to py36.
- To deactivate the environment

```
$ conda deactivate
```

NOTE: You can use up and down key in the keyboard to see command history executed.

How to install and start RStudio

- Activate the virtual environment as

```
$ conda activate R4
```

- Ensure that default environment base is changed to R4.
- Install RStudio using following command in terminal

```
$ conda install -c r rstudio
```

- Similarly, other library/package/module can be installed.
- You can install packages manually from [RStudio](#).
- You start RStudio from terminal

```
$ rstudio
```

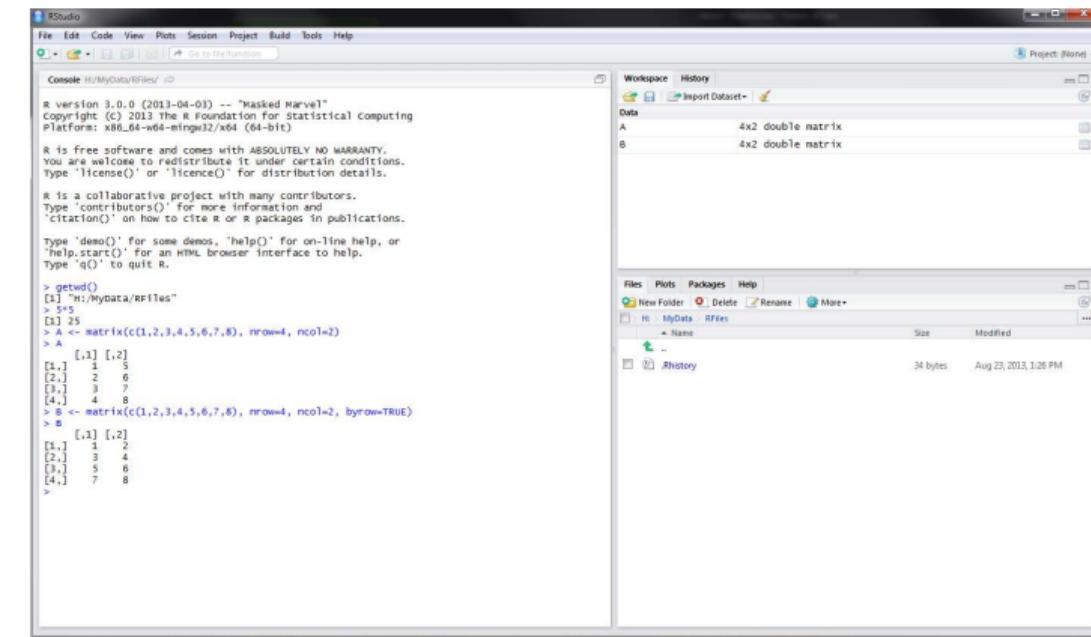
- Alternatively, Jupyter notebook can be used to write your code in R or Python.

How to switch between python and R?

- Deactivate environment if you are already in an environment.
- Then activate environment as per your coding platform.
- Start RStudio or Jupyter Notebook IDE as per you choice.

RStudio screen

- RStudio allows the user to run R in a more user-friendly environment. It is open-source (i.e. free).



Workspace tab

- The workspace tab stores any object, value, function or anything you create during your R session. In the example below, if you click on the dotted squares you can see the data in specific window.

The screenshot shows the RStudio interface with two panels. The top panel displays an R script with code for setting the working directory and creating matrices A and B. The bottom panel shows the workspace tab with three data objects: A, B, and house.pets. Red arrows point from the workspace table to the tabs for 'A', 'B', and 'house.pets' in the top panel.

Showing here matrix B. To see matrix A click on the respective tab.

V1	V2
1	2
3	4
5	6
7	8

Workspace tab content:

Data	Values
A	4x2 double matrix
B	4x2 double matrix
house.pets	3 obs. of 4 variables
Values	feed
	character [3]
	pets
	character [3]
	run
	numeric [3]
	weight
	numeric [3]

Workspace tab

- Here is another example on how the workspace looks like when more objects are added. Notice that the data frame house.pets is formed from different individual values or vectors.

The screenshot shows the RStudio interface with two panes. The top pane is the 'Code' tab, displaying R code for creating a data frame:

```
1 pets <- c("cat", "bunny", "dog")
2 weight <- c(5, 2, 30)
3 feed <- c("yes", "", "no")
4 run <- c(1, NA, 10)
5
6 house.pets <- data.frame(type=pets, weight, feed, run)
7
```

The bottom pane is the 'Workspace' tab, showing the objects in the environment:

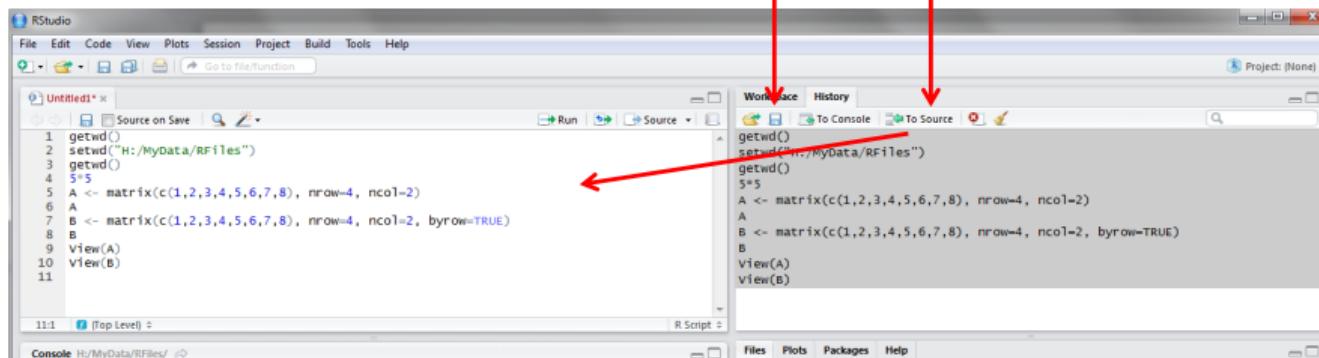
Object	Type	Value
A	4x2 double matrix	
B	4x2 double matrix	
house.pets	3 obs. of 4 variables	
feed	character[3]	
pet	character[3]	
run	numeric[3]	
weight	numeric[3]	

Red arrows point from the code in the top pane to the 'house.pets' data frame in the bottom pane, and from the 'house.pets' entry in the bottom pane to the dotted square icon in the top right corner of the workspace tab.

Click on the dotted square to look at the dataset in a spreadsheet form.

History tab

- The history tab keeps a record of all previous commands. It helps when testing and running processes. Here you can either save the whole list or you can select the commands you want and send them to an R script to keep track of your work.
- In this example, we select all and click on the “To Source” icon, a window on the left will open with the list of commands. Make sure to save the ‘untitled1’ file as an *.R script.



Changing the working directory

The image shows the RStudio interface. A green box highlights the 'Session' menu item in the top navigation bar. A red number '1' is placed above this box. A green box highlights the 'Choose Directory...' option in the 'Set Working Directory' submenu. A red number '2' is placed above this box. A green arrow points from the 'Choose Directory...' option to a separate 'Choose Working Directory' dialog box. This dialog box shows a file tree with 'MyData' selected in the 'Folder:' dropdown. A red number '3' is placed above the 'Select Folder' button in the bottom right corner of the dialog box.

If you have different projects you can change the working directory for that session, see above. Or you can type:

```
# Shows the working directory (wd)  
  
getwd()  
  
# Changes the wd  
  
setwd("C:/myfolder/data")
```

Setting a default working directory

The image shows the RStudio interface. A red arrow points from the 'Tools' menu in the top bar to the 'Options...' button in the 'Tools' dropdown menu. The 'Options...' button is highlighted with a green box and a red number '2'. The 'Default working directory (when not in a project):' field is highlighted with a green box and a red number '3'. The 'OK' button at the bottom right of the 'Options' dialog is highlighted with a green box and a red number '4'.

1

2

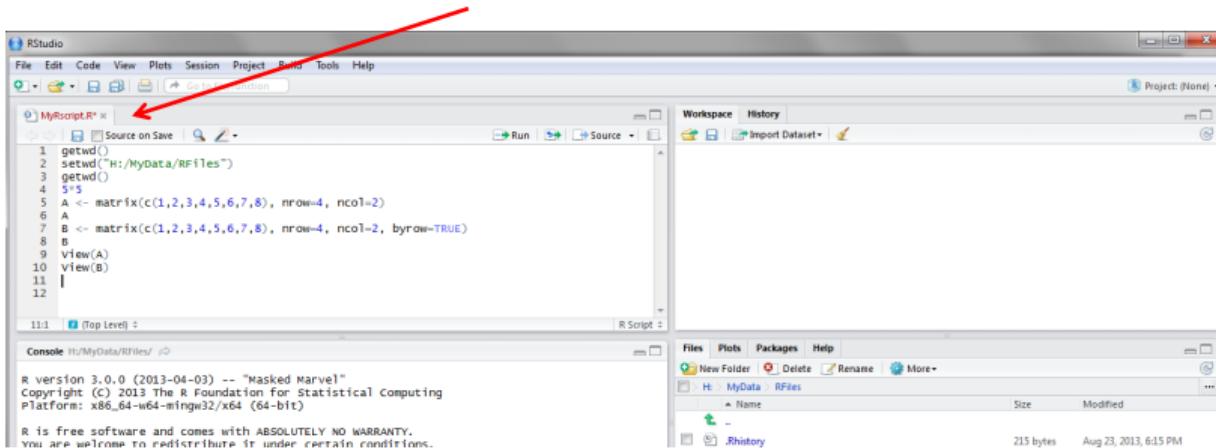
3

4

Every time you open RStudio, it goes to a default directory. You can change the default to a folder where you have your datafiles so you do not have to do it every time. In the menu go to Tools->Options

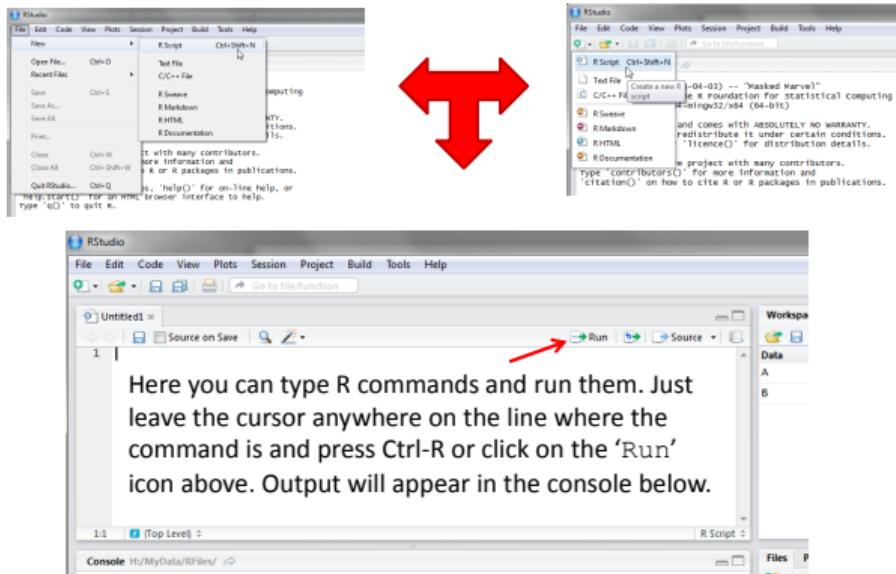
R script

- The usual RStudio screen has four windows:
 1. Console.
 2. Workspace/Environment and history.
 3. Files, plots, packages and help.
 4. The R script(s) and data view. The R script is where you keep a record of your work.



R script

- To create a new R script you can either go to File → New → R Script, or click on the icon with the “+” sign and select “R Script”, or simply press Ctrl+Shift+N. Make sure to save the script.



Packages tab

- The package tab shows the list of add-ons included in the installation of RStudio. If checked, the package is loaded into R, if not, any command related to that package won't work, you will need select it. You can also install other add-ons by clicking on the 'Install Packages' icon.
- Another way to activate a package is by typing, for example, `library(foreign)`. This will automatically check the `-foreign` package (it helps bring data from proprietary formats like Stata, SAS or SPSS).

Packages tab

Install Packages			
Check for Updates			
bitops	Bitwise Operations	1.0-5	<input type="radio"/>
boot	Bootstrap Functions (originally by Angelo Canty for S)	1.3-9	<input type="radio"/>
car	Companion to Applied Regression	2.0-17	<input type="radio"/>
class	Functions for Classification	7.3-7	<input type="radio"/>
cluster	Cluster Analysis Extended Rousseeuw et al.	1.14.4	<input type="radio"/>
codetools	Code Analysis Tools for R	0.2-8	<input type="radio"/>
colorspace	Color Space Manipulation	1.2-2	<input type="radio"/>
compiler	The R Compiler Package	3.0.0	<input type="radio"/>
<input checked="" type="checkbox"/> datasets	The R Datasets Package	3.0.0	<input type="radio"/>
dichromat	Color Schemes for Dichromats	2.0-0	<input type="radio"/>
digest	Create cryptographic hash digests of R objects	0.6.3	<input type="radio"/>
foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, dBase, ...	0.8-53	<input type="radio"/>
ggplot2	An implementation of the Grammar of Graphics	0.9.3.1	<input type="radio"/>
<input checked="" type="checkbox"/> graphics	The R Graphics Package	3.0.0	<input type="radio"/>
<input checked="" type="checkbox"/> grDevices	The R Graphics Devices and Support for Colours and Fonts	3.0.0	<input type="radio"/>
grid	The Grid Graphics Package	3.0.0	<input type="radio"/>
grid	Arrange grobs in tables.	0.1.2	<input type="radio"/>
KernSmooth	Functions for kernel smoothing for Wand & Jones (1995)	2.23-10	<input type="radio"/>

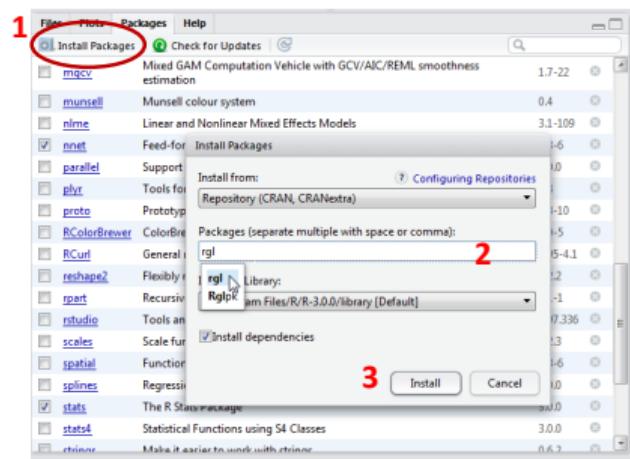
Install Packages			
Check for Updates			
bitops	Bitwise Operations	1.0-5	<input type="radio"/>
boot	Bootstrap Functions (originally by Angelo Canty for S)	1.3-9	<input type="radio"/>
car	Companion to Applied Regression	2.0-17	<input type="radio"/>
class	Functions for Classification	7.3-7	<input type="radio"/>
cluster	Cluster Analysis Extended Rousseeuw et al.	1.14.4	<input type="radio"/>
codetools	Code Analysis Tools for R	0.2-8	<input type="radio"/>
colorspace	Color Space Manipulation	1.2-2	<input type="radio"/>
compiler	The R Compiler Package	3.0.0	<input type="radio"/>
<input checked="" type="checkbox"/> datasets	The R Datasets Package	3.0.0	<input type="radio"/>
dichromat	Color Schemes for Dichromats	2.0-0	<input type="radio"/>
digest	Create cryptographic hash digests of R objects	0.6.3	<input type="radio"/>
<input checked="" type="checkbox"/> foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, dBase, ...	0.8-53	<input type="radio"/>
ggplot2	An implementation of the Grammar of Graphics	0.9.3.1	<input type="radio"/>
<input checked="" type="checkbox"/> graphics	The R Graphics Package	3.0.0	<input type="radio"/>
<input checked="" type="checkbox"/> grDevices	The R Graphics Devices and Support for Colours and Fonts	3.0.0	<input type="radio"/>
grid	The Grid Graphics Package	3.0.0	<input type="radio"/>
grid	Arrange grobs in tables.	0.1.2	<input type="radio"/>
KernSmooth	Functions for kernel smoothing for Wand & Jones (1995)	2.23-10	<input type="radio"/>



Installing a package

RCurl	General network (HTTP/FTP/...) client interface for R	1.95-4.1
reshape2	Flexibly reshape data: a reboot of the reshape package.	1.2.2
rpart	Recursive Partitioning	4.1-1

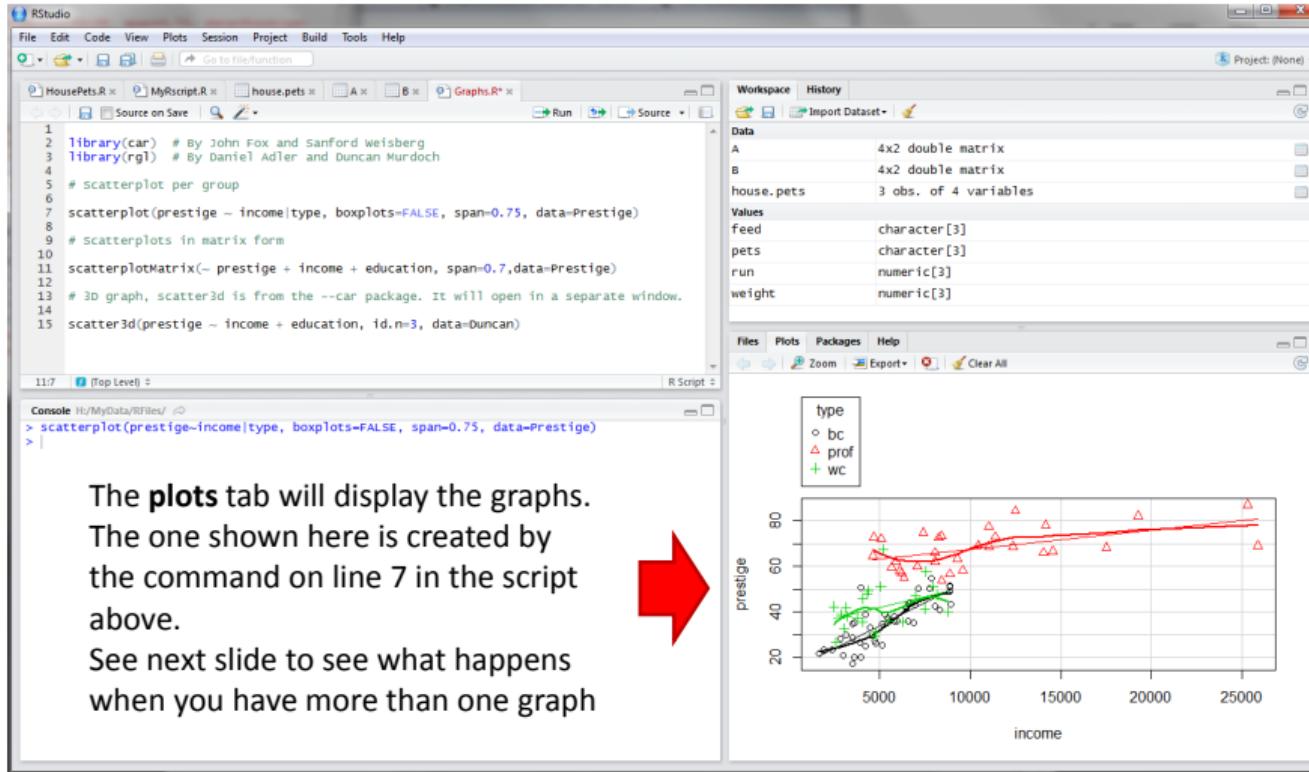
Before



After

RCurl	General network (HTTP/FTP/...) client interface for R	1.95-4.1
reshape2	Flexibly reshape data: a reboot of the reshape package.	1.2.2
rgl	3D visualization device system (OpenGL)	0.93.952
rpart	Recursive Partitioning	4.1-1

Plots tab



The image shows a screenshot of the RStudio interface. The left pane displays an R script with code for creating a scatterplot. The right pane shows the RStudio environment and a scatterplot in the Plots tab. A red arrow points from the text below to the scatterplot.

The plots tab will display the graphs.
The one shown here is created by
the command on line 7 in the script
above.
See next slide to see what happens
when you have more than one graph

1
2 `library(car) # By John Fox and Sanford Weisberg`
3 `library(rgl) # By Daniel Adler and Duncan Murdoch`
4
5 `# scatterplot per group`
6
7 `scatterplot(prestige ~ income | type, boxplots=FALSE, span=0.75, data=Prestige)`
8
9 `# scatterplots in matrix form`
10
11 `scatterplotMatrix(~ prestige + income + education, span=0.7, data=Prestige)`
12
13 `# 3D graph, scatter3d is from the --car package. It will open in a separate window.`
14
15 `scatter3d(prestige ~ income + education, id.n=3, data=Duncan)`

11:7 (Top Level) R Script

Console H:/MyData/RFiles/ > `scatterplot(prestige ~ income | type, boxplots=FALSE, span=0.75, data=Prestige)`
> |

Workspace History

Data

- A 4x2 double matrix
- B 4x2 double matrix
- house.pets 3 obs. of 4 variables

Values

- feed character[3]
- pets character[3]
- run numeric[3]
- weight numeric[3]

Plots Packages Help

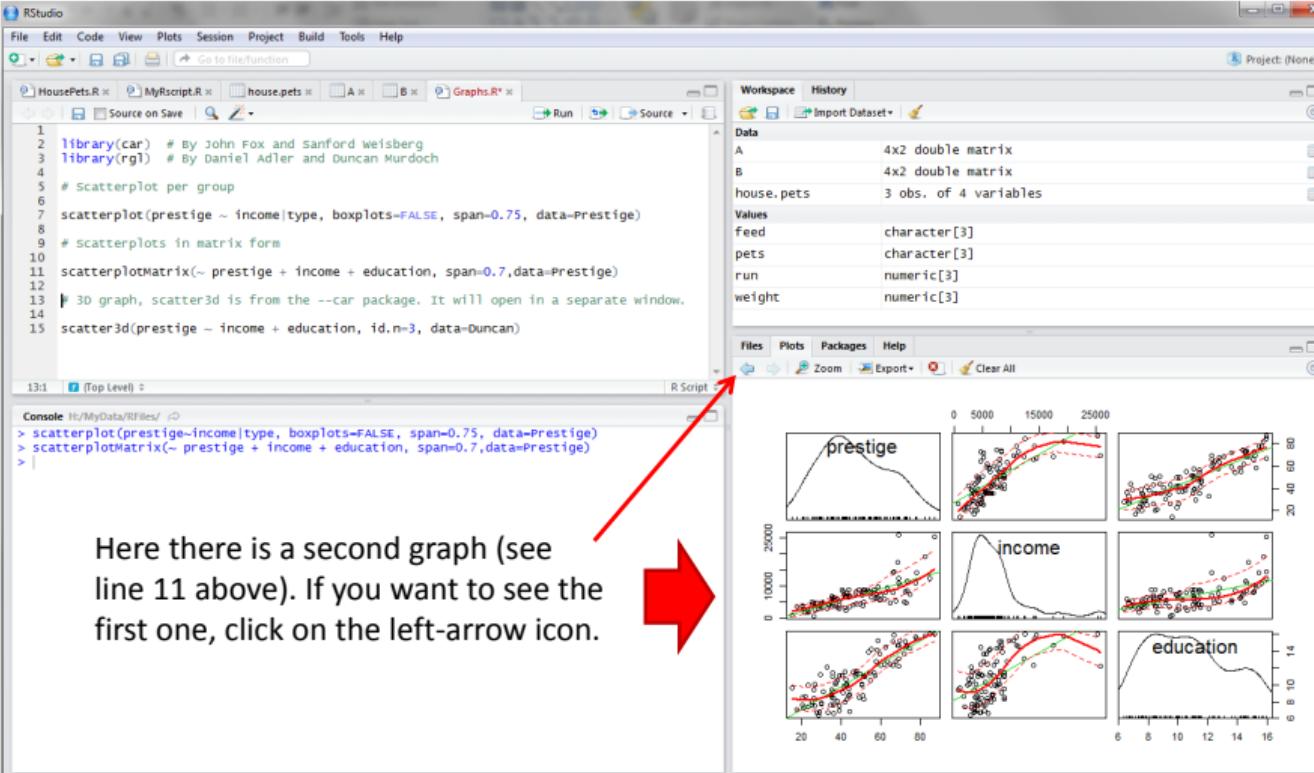
type

- bc
- prof
- wc

prestige

income

Plots tab



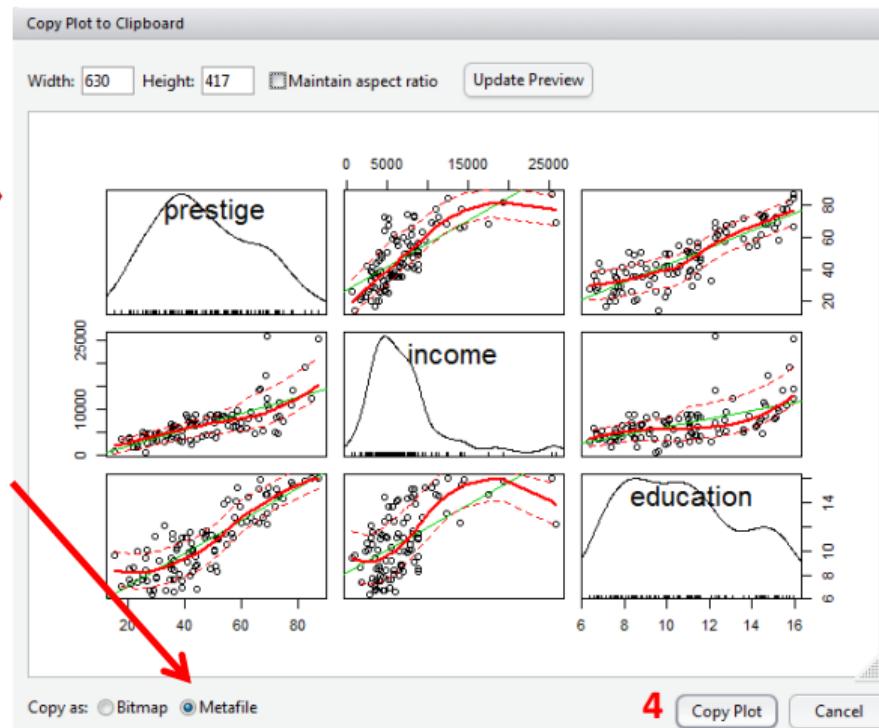
Here there is a second graph (see line 11 above). If you want to see the first one, click on the left-arrow icon.

The screenshot shows the RStudio interface. The left pane contains an R script with code for scatterplots and a scatterplot matrix. The console shows the execution of these commands. The right pane is the 'Plots' tab, which displays a 3x3 grid of plots. The plots are as follows:

- Row 1: 'prestige' (a density plot), 'income' (a scatterplot with a red regression line), and 'education' (a scatterplot with a red regression line).
- Row 2: 'income' (a scatterplot with a red regression line), 'education' (a scatterplot with a red regression line), and 'prestige' (a density plot).
- Row 3: 'education' (a scatterplot with a red regression line), 'prestige' (a density plot), and 'income' (a scatterplot with a red regression line).

A large red arrow points from the explanatory text below to the left arrow icon in the 'Plots' tab header.

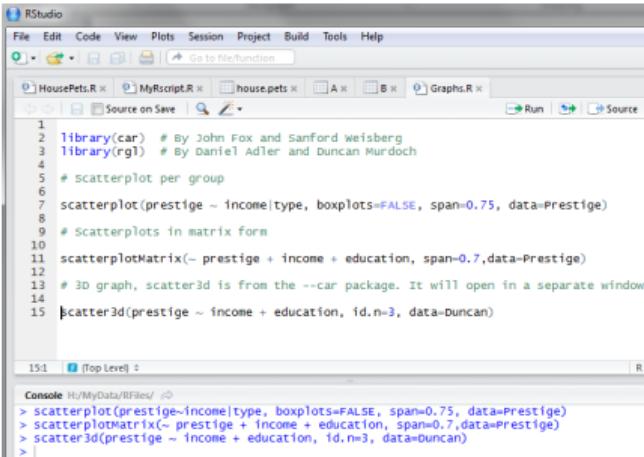
Plots tab - Graphs export



3 Make sure to select 'Metafile'

5 Paste it into your Word document

Plots tab - 3D graphs



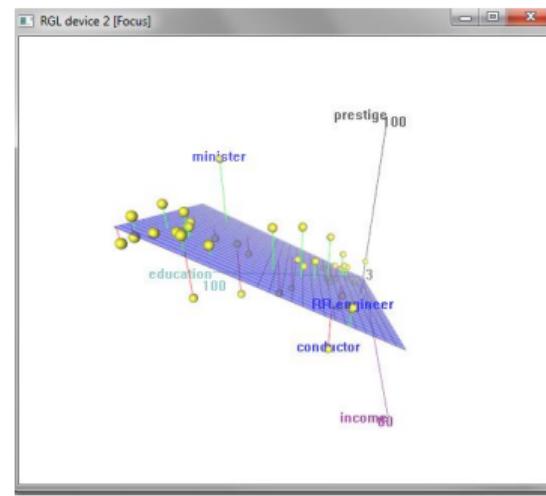
The screenshot shows the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Project, Build, Tools, and Help. Below the menu is a toolbar with various icons. The main area contains several tabs: HousePets.R, MyScript.R, house.pets, A, B, and Graphs.R. The Graphs.R tab is active, showing the following R code:

```
1 library(car) # By John Fox and Sanford Weisberg
2 library(rgl) # By Daniel Adler and Duncan Murdoch
3
4 # scatterplot per group
5
6 scatterplot(prestige ~ income|type, boxplots=FALSE, span=0.75, data=Prestige)
7
8 # Scatterplots in matrix form
9
10 scatterplotMatrix(~ prestige + income + education, span=0.7, data=Prestige)
11
12 # 3D graph, scatter3d is from the --car package. It will open in a separate window.
13
14 scatter3d(prestige ~ income + education, id.n=3, data=duncan)
15
```

The console at the bottom shows the execution of the code:

```
19:1 [Top Level] >
> scatterplot(prestige ~ income|type, boxplots=FALSE, span=0.75, data=Prestige)
> scatterplotMatrix(~ prestige + income + education, span=0.7, data=Prestige)
> scatter3d(prestige ~ income + education, id.n=3, data=duncan)
>
```

3D graphs will display on a separate screen (see line 15 above). You won't be able to save it, but after moving it around, once you find the angle you want, you can screenshot it and paste it to your Word document.



References

-  Introduction to RStudio, <https://dss.princeton.edu/training/RStudio101.pdf>
-  The Comprehensive R Archive Network, <https://cran.r-project.org/>
-  RStudio Desktop,
<https://www.rstudio.com/products/rstudio/download/#download>
-  Anaconda, Where packages, notebooks, projects and environments are shared,
<https://www.anaconda.com/products/individual>



Thank you!