آشنایی با نرم‌افزار R و کاربرد آن در آمار و طرح آزمایشات

دکتر پرویز مرادی

PhD Medicinal Plant Metabolomics
University of Birmingham, UK

عضو هیات علمی مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی استان زنجان

parvizmoradi@gmail.com

سرفصل مطالب

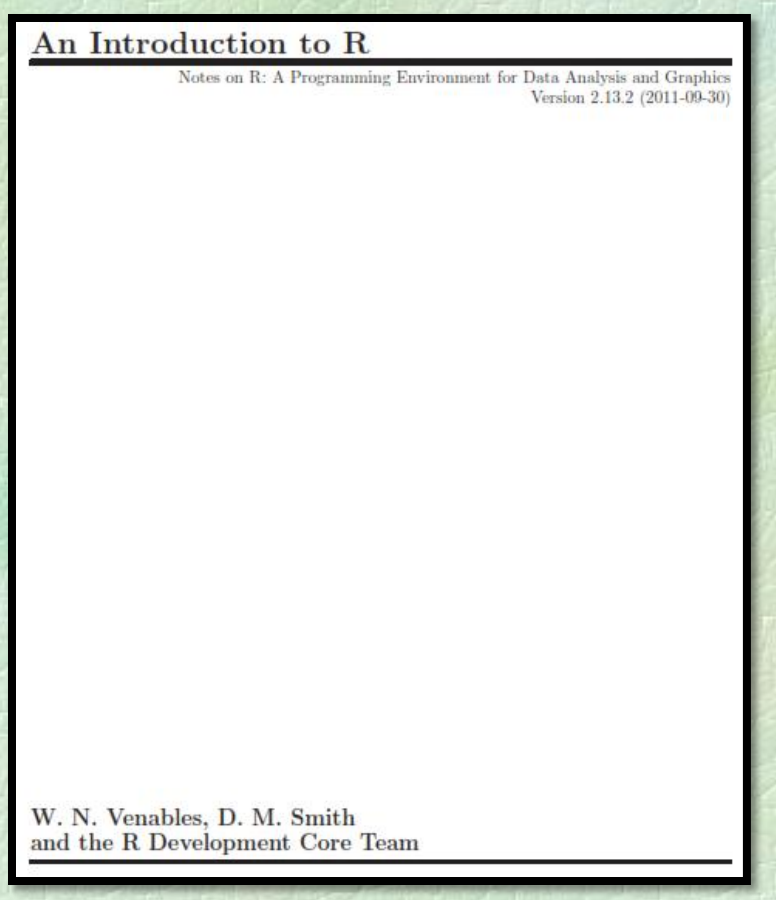
- چرا R ؟
- دانلودو نصب نرم‌افزار R و Rstudio
- آشنایی با محیط Rstudio
- آشنایی با دستورات ساده R
- کارکردن با داده‌ها و ایجاد فایل داده‌ای

جلسه اول و دوم

- یادآوری آمار مقدماتی
- محاسبه آماره های توصیفی
- انواع آزمون تی استیودنت
- رگرسیون و همبستگی
- کاربرد R در طرح آزمایشات

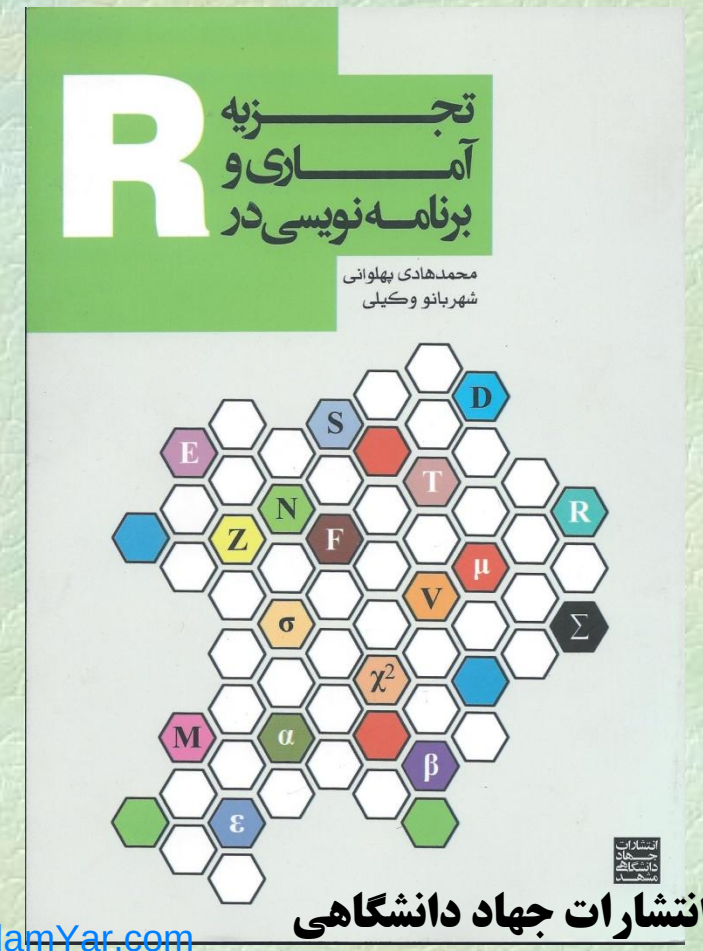
جلسه سوم و چهارم

منابع مورد استفاده


An Introduction to R

Notes on R: A Programming Environment for Data Analysis and Graphics
Version 2.13.2 (2011-09-30)

W. N. Venables, D. M. Smith
and the R Development Core Team



انتشارات جهاد دانشگاهی

محمدهادی پهلوانی، شهربانو وکیلی

❑چرا R ؟

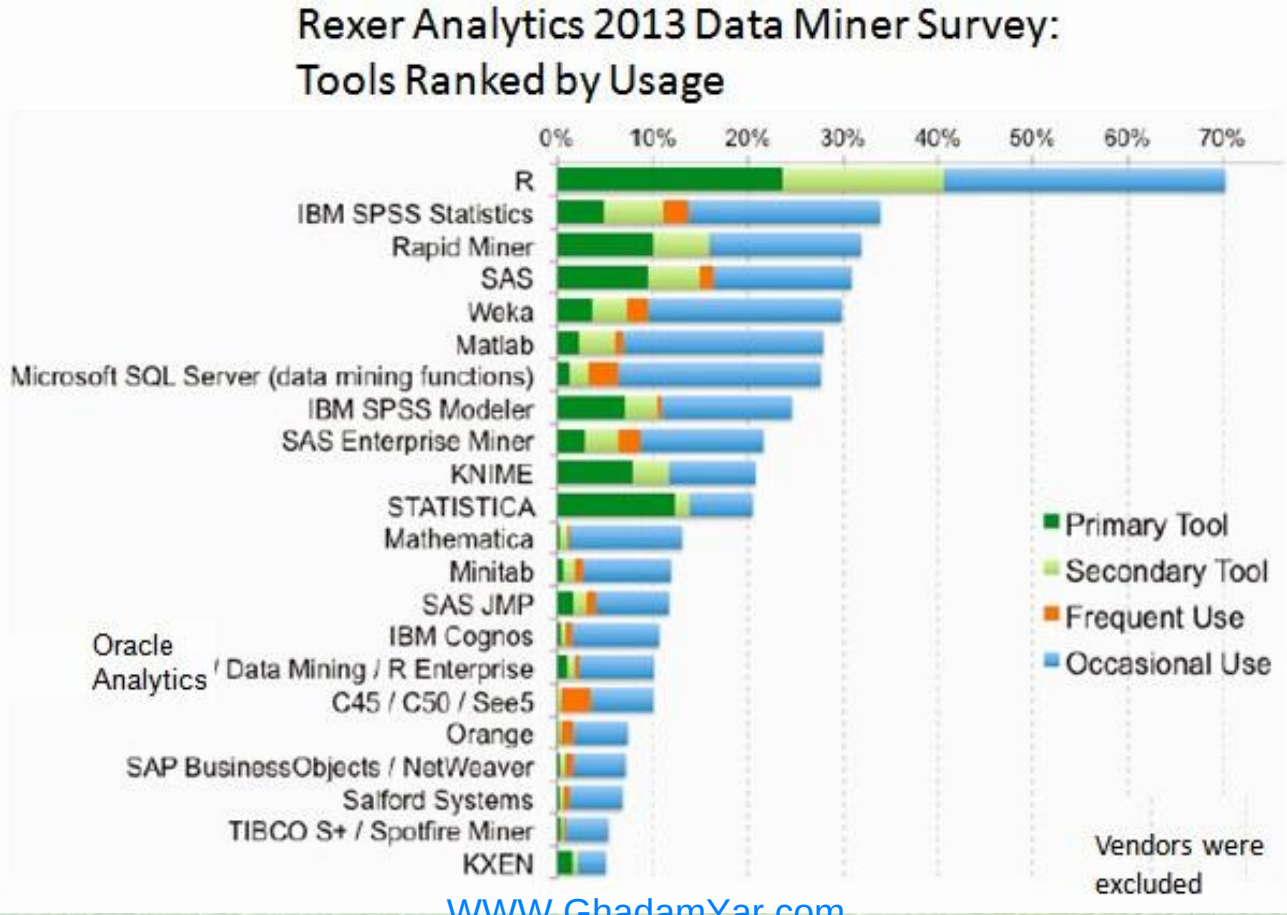
زبان‌ها و نرم‌افزارهای زیادی برای محاسبات آماری، از جمله SAS، MatLabو SPSS و غیره وجود دارد.

پس مزیت استفاده از زبان R چیست؟

- مهمترین امتیاز رایگان و open-sourceبودن آن
- به روزرسانی دائمی
- ساده بودن زبان R
- وجود بسته‌های نرم‌افزاری فراوان برای تمام محاسبات آماری در همه زمینه‌های تحقیقاتی
- کاربران فراوانی در دنیا هستند که قبلا بسته های آماری مورد نیاز را تهیه کرده اند و الان هم می توانند به کاربران جدید راهنمایی کنند.

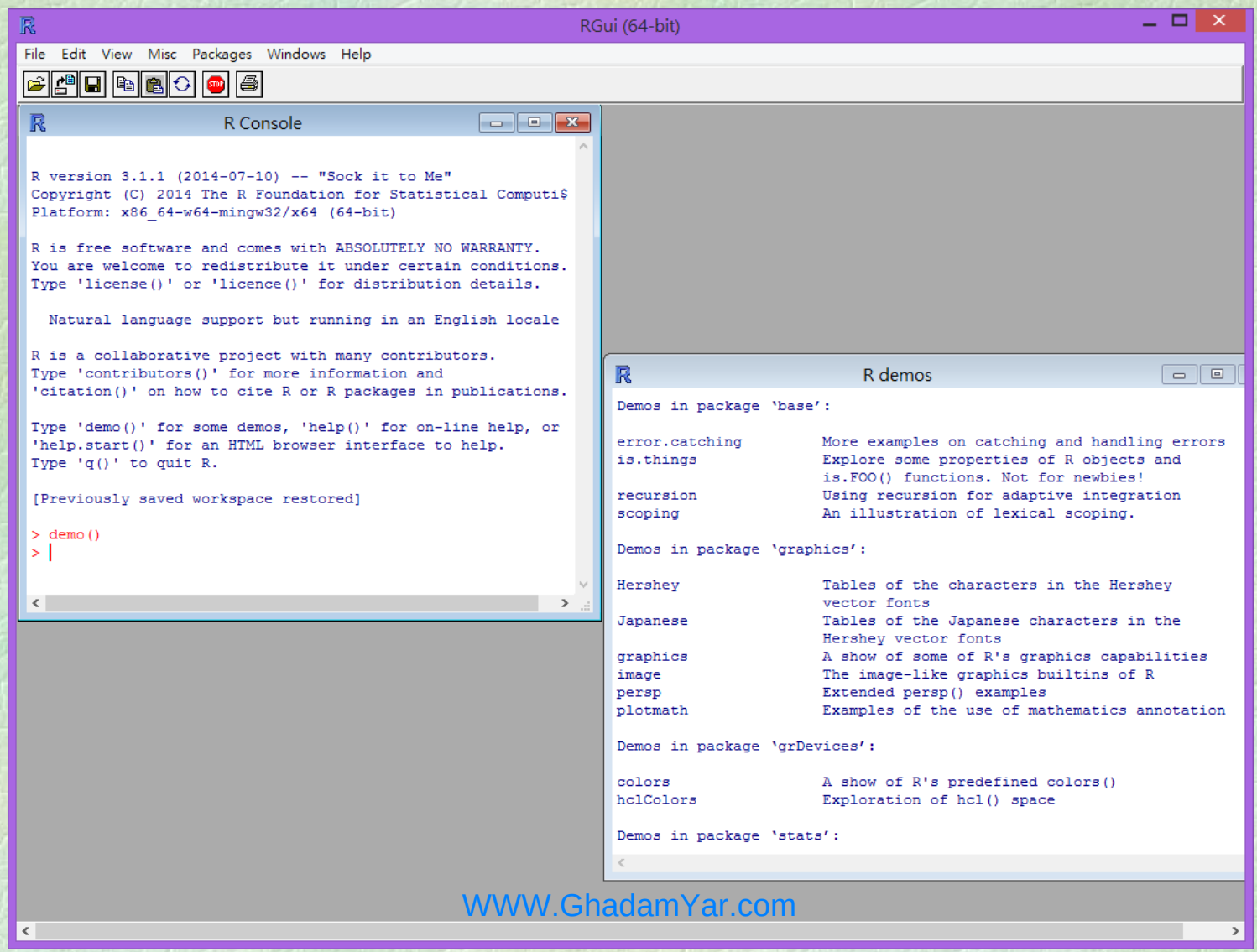
❑ R چیست؟

یک نرم افزار قدرتمند برای تجزیه های آماری است و اساسا جزئی از زبان S و S-Plus است.
در ابتدا توسط دو برنامه‌نویس به نام‌های Ross Ihaka and Robert Gentleman در گروه آمار دانشگاه اوکلند طراحی شد و به همین دلیل در سال‌های اولیه به آن "R&R" هم می‌گفتند.



http://www.kdnuggets.com/2013/10/rexer-analytics-2013-data-miner-survey-highlights.html

R



WWW.GhadamYar.com

- RStudio is a free and open source integrated development environment (IDE) for R.
- Two editions:
  - RStudio Desktop, where the program is run locally as a regular desktop application;
  - RStudio Server, which allows accessing RStudio using a web browser while it is running on a remote Linux server.
- http://www.rstudio.org/

RStudio

```
##########
#Data frames
planets = c("Mercury", "Venus", "Earth", "Mars", "Jupiter", "Saturn", "Uranu
type = c("Terrestrial planet", "Terrestrial planet", "Terrestrial planet", "
diameter = c(0.382,0.949,1,0.532,11.209,9.449,4.007,3.883);
rotation = c(58.64,-243.02,1,1.03,0.41,0.43,-0.72,0.67);
rings= c(FALSE,FALSE,FALSE,FALSE,TRUE,TRUE,TRUE,TRUE);
# Create the data frame:
planets_df  =data.frame(planets, type, diameter, rotation, rings)


# Check the structure of planets_df
str(planets_df)
planets_df
# with the help of square brackets?  ]
closest_planets_df = planets_df[1:3,]
furthest_planets_df = planets_df[6:8,]
# Have a look:
```

Console C:/GeorgeFiles/www/~jsyeh/1031/DM/PPT&PDF/cflin R/

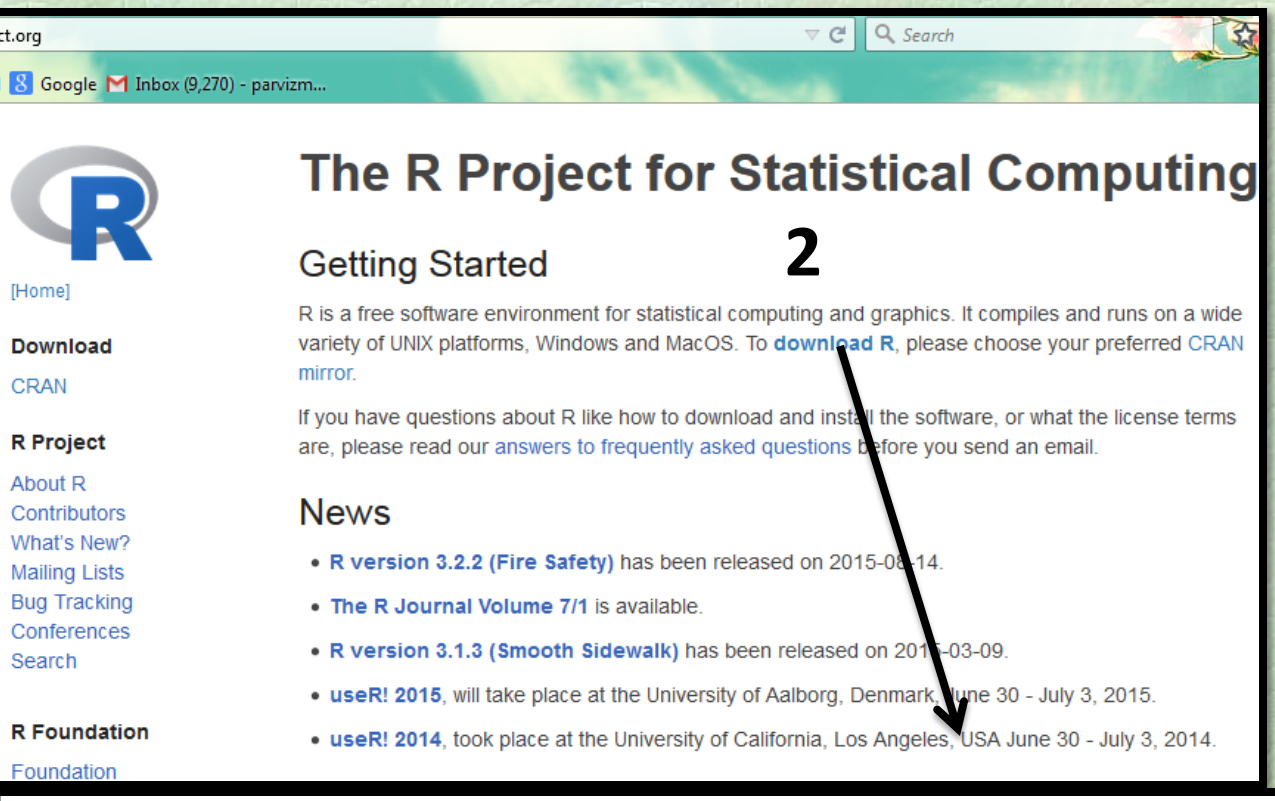
Environment is empty

Name	Description	Version
User Library		
manipulate	Interactive Plots for RStudio	0.98.1083
rstudio	Tools and Utilities for RStudio	0.98.1083
System Library		
boot	Bootstrap Functions (originally by Angelo Canty for S)	1.3-11
class	Functions for Classification	7.3-10
cluster	Cluster Analysis Extended Rousseeuw et al.	1.15.2
codetools	Code Analysis Tools for R	0.2-8
compiler	The R Compiler Package	3.1.1
datasets	The R Datasets Package	3.1.1
foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-61
graphics	The R Graphics Package	3.1.1
grDevices	The R Graphics Devices and Support for Colours and Fonts	3.1.1
grid	The Grid Graphics Package	3.1.1
KernSmooth	Functions for kernel smoothing for Wand & Jones (1995)	2.23-12

WWW.GhadamYar.com

❑دانلودو نصب نرم‌افزار R و Rstudio

1 https://www.r-project.org/



3

India	
http://ftp.iitm.ac.in/cran/	Indian Institute of Technology Madras
Indonesia	
http://cran.repo.bppt.go.id/	Agency for The Application and Assessment of Technology
Iran	
http://cran.um.ac.ir/	Ferdowsi University of Mashhad
Ireland	
http://ftp.heanet.ie/mirrors/cran.r-project.org/	HEAnet,Dublin
Italy	
http://cran.mirror.garr.it/mirrors/CRAN/	Garr Mirror, Milano

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 (2015-08-14, Fire Safety) R-3.2.2.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.
- Contributed extension packages

Questions About R

- 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.

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R for Windows

CRAN
Mirrors
What's new?
Task Views
Search

About R
R Homepage
The R Journal

Software

Subdirectories:

base	Binaries for base distribution (managed by Duncan Murdoch). This is what you want to **install R for the first time**.
contrib	Binaries of contributed packages (managed by Uwe Ligges). There is also information on third party software available for CRAN Windows services and corresponding environment and make variables.
Rtools	Tools to build R and R packages (managed by Duncan Murdoch). 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 Duncan Murdoch or Uwe Ligges directly in case of questions / suggestions rel 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.

R-3.2.2 for Windows (32/64 bit)

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

Download R 3.2.2 for Windows (62 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 exactly matches the package distributed by R, fingerprint. You will need a version of md5sum for windows: both graphical and command line versions are availa

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

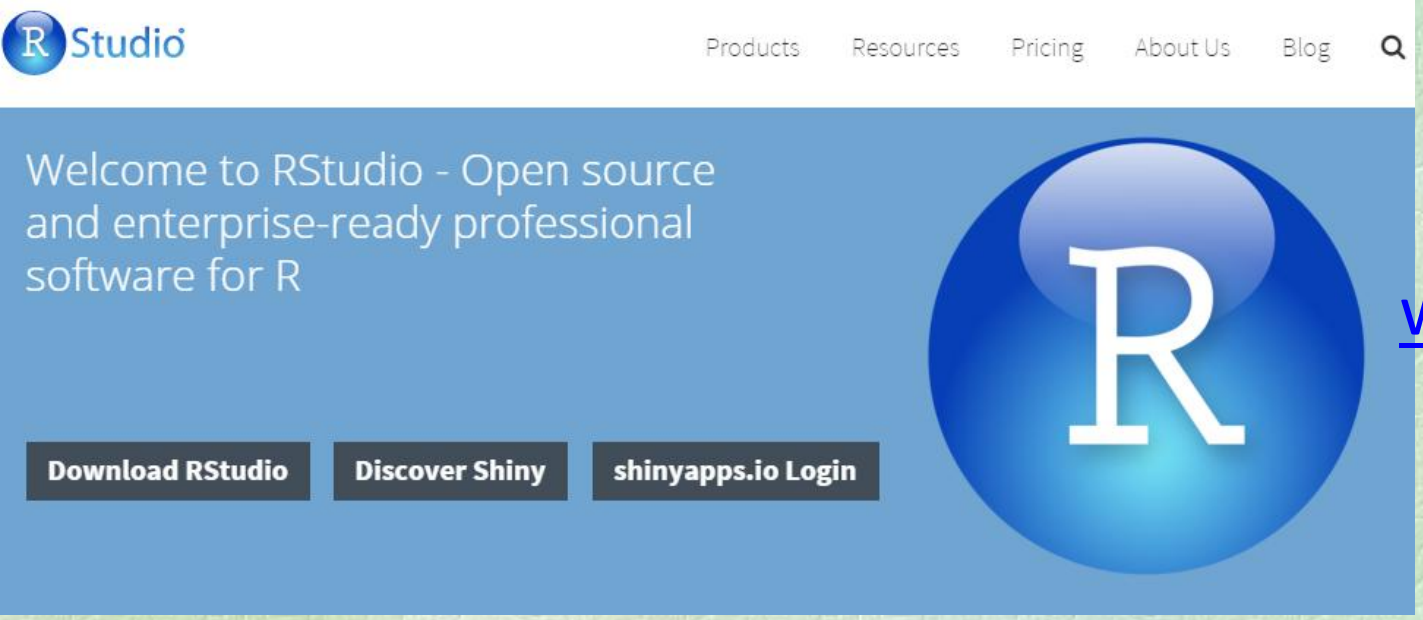
- Patches to this release are incorporated in the r-patched snapshot build.
- A build of the development version (which will eventually become the next major release of R) is available
- Previous releases

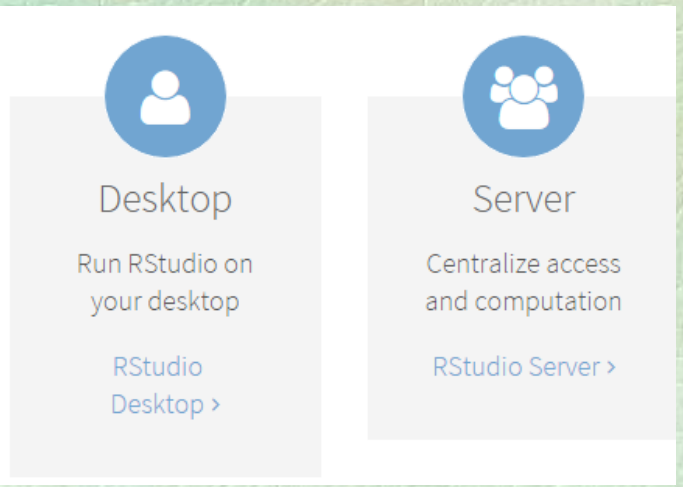
Note to webmasters: A stable link which will redirect to the current Windows binary release is <CRAN MIRROR>/bin/windows/base/release.htm.

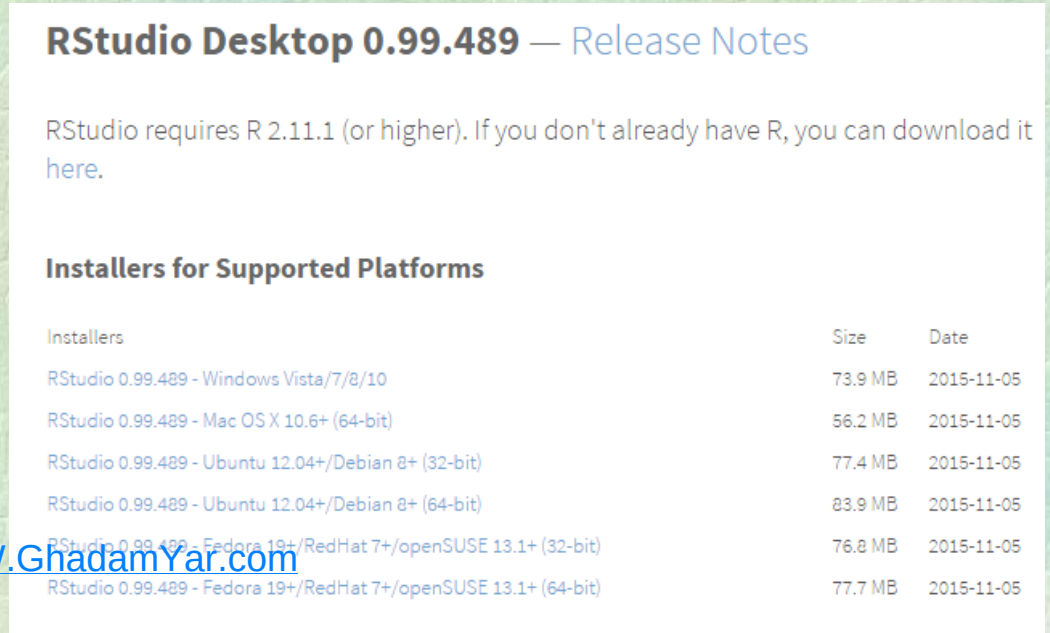
Last change: 2015-08-14, by Duncan Murdoch

نصب Rstudio

www.rstudio.org







RStudio Desktop 0.99.489 — Release Notes

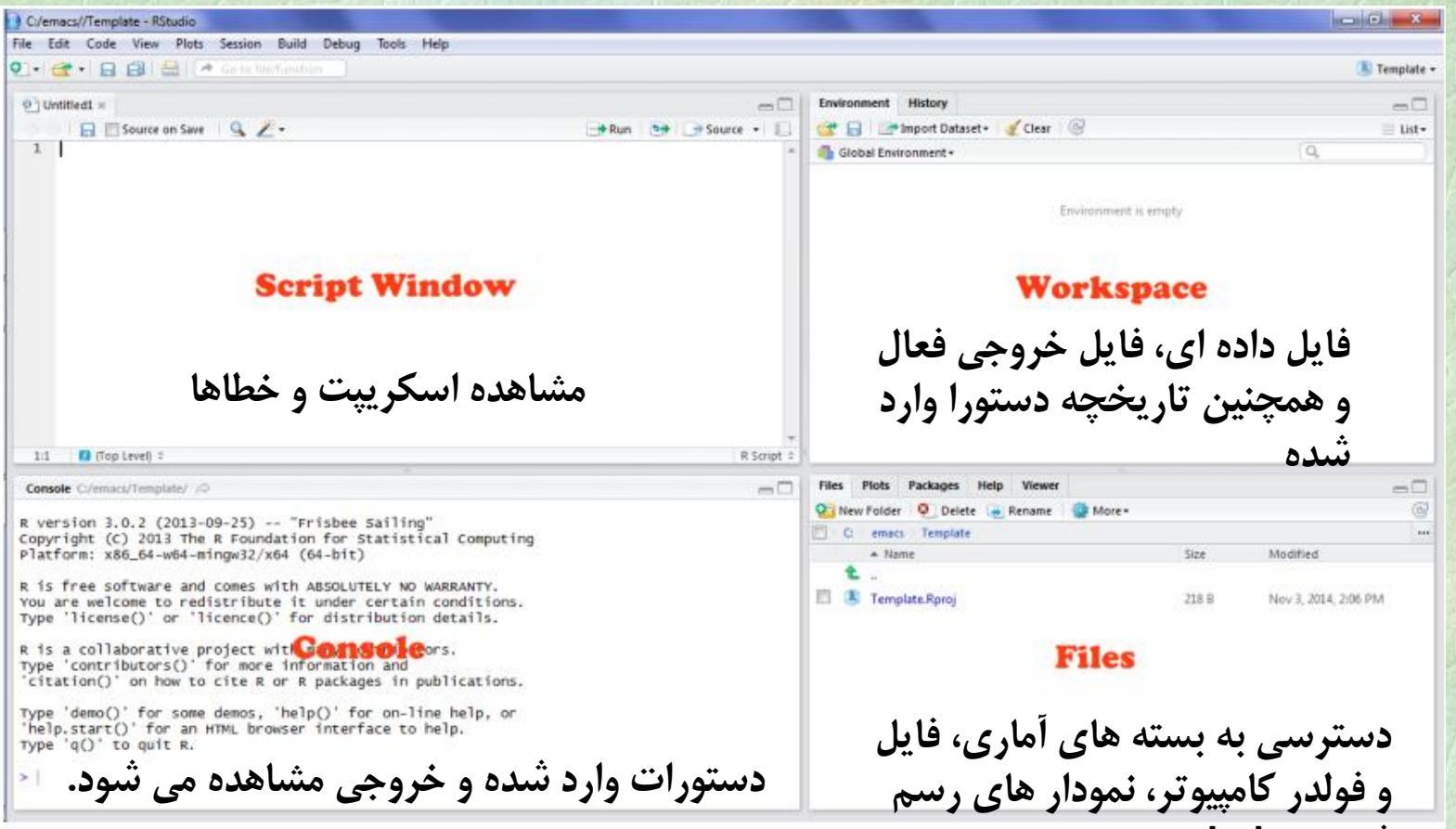
RStudio requires R 2.11.1 (or higher). If you don't already have R, you can download it here.

Installers for Supported Platforms

Installers	Size	Date
RStudio 0.99.489 - Windows Vista/7/8/10	73.9 MB	2015-11-05
RStudio 0.99.489 - Mac OS X 10.6+ (64-bit)	56.2 MB	2015-11-05
RStudio 0.99.489 - Ubuntu 12.04+/Debian 8+ (32-bit)	77.4 MB	2015-11-05
RStudio 0.99.489 - Ubuntu 12.04+/Debian 8+ (64-bit)	83.9 MB	2015-11-05
RStudio 0.99.489 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)	76.8 MB	2015-11-05
RStudio 0.99.489 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)	77.7 MB	2015-11-05

بعد از این که دانلود RStudio به پایان رسید آن را نیز نصب کنید.

اجرای برنامه RStudio



R documentation and help

برای آشنایی کلی با این نرم افزار (Manual, References, Material) :

- > help.start()
- اگر دستور را می دانید ولی جزئیات آنرا نمی دانید:
- > ?plot

Tips and Reminders

- R is case-sensitive
- Comment your code so you remember what it does; comments are preceded with #
- R scripts are simply text files with a .R extension
- Use Ctrl + R to submit code
- Use the Tab key to let R/R Studio finish typing commands for you
- Use Shift + down arrow to highlight lines or blocks of code
- In R Studio: Ctrl + 1 and Ctrl + 2 switches between script and console
- Use up and down arrows to cycle through previous commands in console
- Don’t be afraid of errors; you won’t break R
- If you get stuck, Google is your friend

استفاده از R به عنوان ماشین حساب

+ add
- subtract
* multiply
/ divide
^ raise to the power

- 1+3
- 4

$$bmi = \frac{weight}{height^2}, \text{units}\left[\frac{kg}{m^2}\right]$$

```
bmi = 75/1.75^2
bmi
[1] 24.48980
```

Underweight: BMI is less than 18.5
Normal weight: BMI is 18.5 to 24.9
Overweight: BMI is 25 to 29.9
Obese: BMI is 30 or more

log, exp, sin, tan, sqrt, etc.

```
sin(pi)
1.224606e-16
```

Category	BMI range – kg/m^2	BMI Prime
Very severely underweight	less than 15	less than 0.60
Severely underweight	from 15.0 to 16.0	from 0.60 to 0.64
Underweight	from 16.0 to 18.5	from 0.64 to 0.74
Normal (healthy weight)	from 18.5 to 25	from 0.74 to 1.0
Overweight	from 25 to 30	from 1.0 to 1.2
Obese Class I (Moderately obese)	from 30 to 35	from 1.2 to 1.4
Obese Class II (Severely obese)	from 35 to 40	from 1.4 to 1.6
Obese Class III (Very severely obese)	over 40	over 1.6

دستورات اختصاص داده ها به متغیر (عدد، بردار، ماتریس)

- x=1
- x = 0:4
- x <- c(0,2,-1,pi,10)

```
 0.000000  2.000000 -1.000000  3.141593 10.000000
```

- x=c(1:4,3:9)

```
0 1 2 3 4
```

- x <- seq(0,2,.25)

```
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00
```

- rep(1:2,4)

```
1 2 1 2 1 2 1 2
```

مثالی از کار با بردار

```
> x <- 1:10
> x
 [1]  1  2  3  4  5  6  7  8  9 10
> x2 <- x^2
> x2
 [1]   1   4   9  16  25  36  49  64  81 100
> sqrt(x2)
 [1]  1  2  3  4  5  6  7  8  9 10
```

ایجاد فایل داده ای به صورت ماتریس و فراخوان آن

Format Painter | Clipboard | Font | Alignme

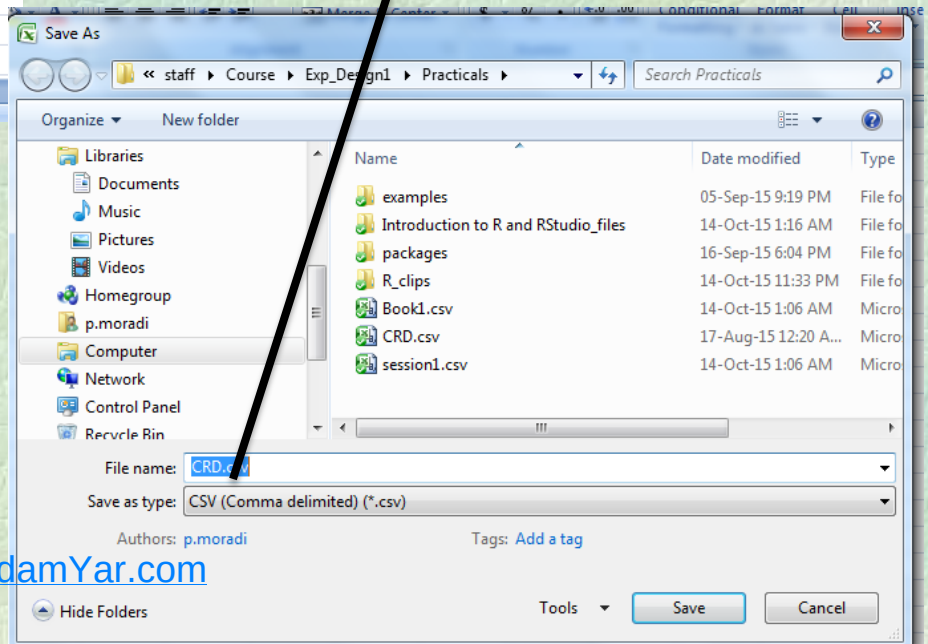
A1 | rep

	A	B	C	D	E	F	G
1	rep	treat	yield				
2	1	1	30				
3	1	2	9				
4	1	3	16				
5	1	4	10				
6	1	5	30				
7	1	6	18				
8	1	7	17				
9	2	1	18				
10	2	2	9				
11	2	3	10				
12	2	4	4				
13	2	5	7				
14	2	6	24				
15	2	7	7				
16	3	1	32				
17	3	2	16				
18	3	3	18				
19	3	4	4				
20	3	5	21				
21	3	6	12				
22	3	7	16				
23	4	1	26				
24	4	2	4				
25	4	3	18				

CRD

Ready

Save as CRD.CSV
(Comma delimitted)

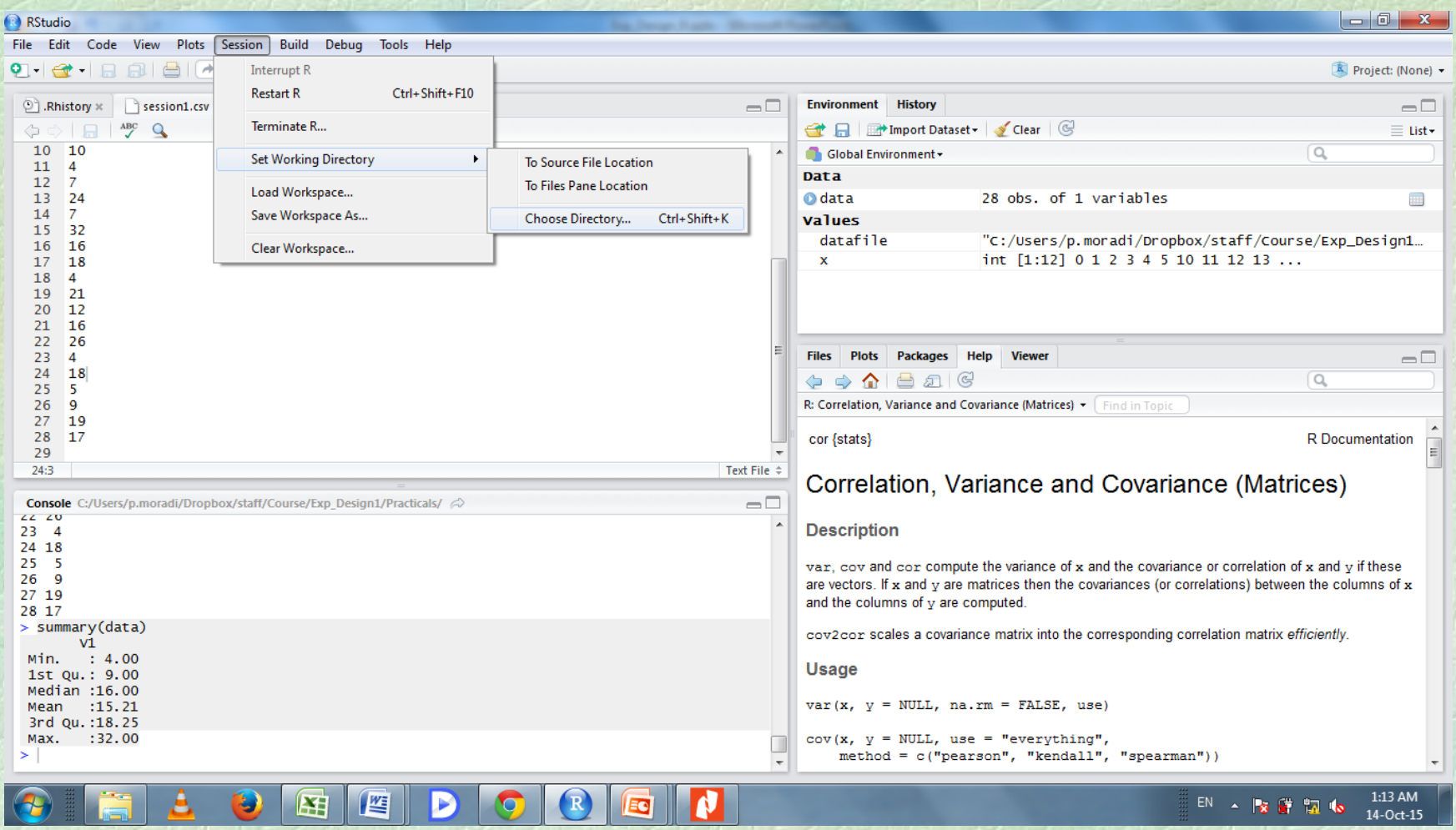


تیمارها

A	B	C	D	E	F	G
۳۰	۹	۱۶	۱۰	۳۰	۱۸	۱۷
۱۸	۹	۱۰	۴	۷	۲۴	۷
۳۲	۱۶	۱۸	۴	۲۱	۱۲	۱۶
۲۶	۴	۱۸	۵	۹	۱۹	۱۷

فراخوان فایل داده ای

۱– دایرکتوری حاوی داده ها را معرفی می کنیم.



۲– داده ها را فراخوان می کنیم

```
data=read.csv("CRD.csv", header=T)
```

OR

```
data=read.table("CRD.txt",header=TRUE)
```

RStudio

File Edit Code View Plots Session Build Debug Tools Help

Go to file/function

Project: (None)

.Rhistory × data ×

28 observations of 3 variables

	rep	treat	yield
1	1	1	30
2	1	2	9
3	1	3	16
4	1	4	10
5	1	5	30
6	1	6	18
7	1	7	17
8	2	1	18
9	2	2	9
10	2	3	10
11	2	4	4
12	2	5	7
13	2	6	24
14	2	7	7
15	3	1	32

Console C:/Users/p.moradi/Dropbox/staff/Course/Exp_Design1/Practicals/

```
13   3   1   32
16   3   2   16
17   3   3   18
18   3   4    4
19   3   5   21
20   3   6   12
21   3   7   16
22   4   1   26
23   4   2    4
24   4   3   18
25   4   4    5
26   4   5    9
27   4   6   19
28   4   7   17
> View(data)
>
```

Environment History

Import Dataset Clear List

Global Environment

Data

data 28 obs. of 3 variables

Files Plots Packages Help Viewer

Install Packages Check for Updates

agricolae	Statistical Procedures for Agricultural Research	1.1-8
boot	Bootstrap Functions (originally by Angelo Canty for S)	1.3-11
class	Functions for Classification	7.3-10
cluster	Cluster Analysis Extended Rousseeuw et al.	1.15.2
codetools	Code Analysis Tools for R	0.2-8
compiler	The R Compiler Package	3.1.0
datasets	The R Datasets Package	3.1.0
foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-61
graphics	The R Graphics Package	3.1.0
grDevices	The R Graphics Devices and Support for Colours and Fonts	3.1.0
grid	The Grid Graphics Package	3.1.0
KernSmooth	Functions for kernel smoothing for Wand & Jones (1995)	2.23-12
lattice	Lattice Graphics	0.20-29
manipulate	Interactive Plots for RStudio	0.98.501
MASS	Support Functions and Datasets for Venables and Ripley's MASS	7.3-31

EN 6:48 PM 31-Oct-15

فراخوانی داده ها به طور مستقیم از اکسل

Google

cran package rJava

Web Images Shopping Maps Videos More Search tools

About 16,400 results (0.26 seconds)

CRAN - Package rJava
https://cran.r-project.org/package=rJava R
Jul 29, 2015 - rJava: Low-Level R to Java Interface. Low-level interface to Java VM very much like .C/.Call and friends. Allows creation of objects, calling ...

[PDF] Package 'rJava' - CRAN
https://cran.r-project.org/web/packages/rJava/rJava.pdf R
by S Urbanek - 2012 - Cited by 5 - Related articles
Package 'rJava'. July 29, 2015. Version 0.9-7. Title Low-Level R to Java Interface. Author Simon Urbanek <simon.urbanek@r-project.org>. Maintainer Simon ...

۱– دانلود و نصب پکیج rJava

Google

cran package xlsxjars

Web Images Shopping Maps Videos More Search tools

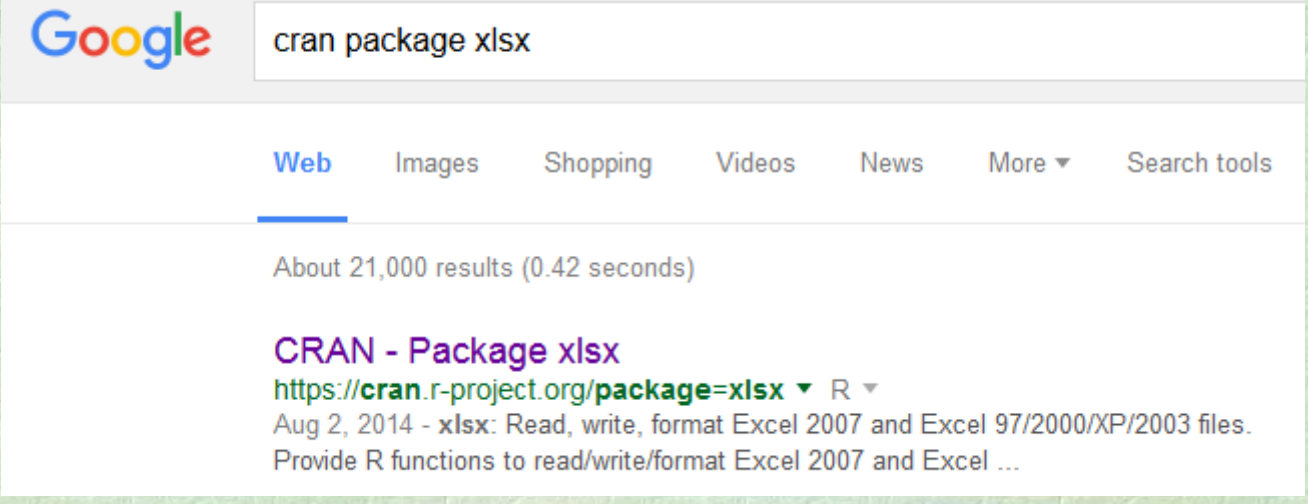
About 1,560 results (0.45 seconds)

CRAN - Package xlsxjars
https://cran.r-project.org/package=xlsxjars R
Aug 22, 2014 - xlsxjars: Package required POI jars for the xlsx package. The xlsxjars package collects all the external jars required for the xlxs package.

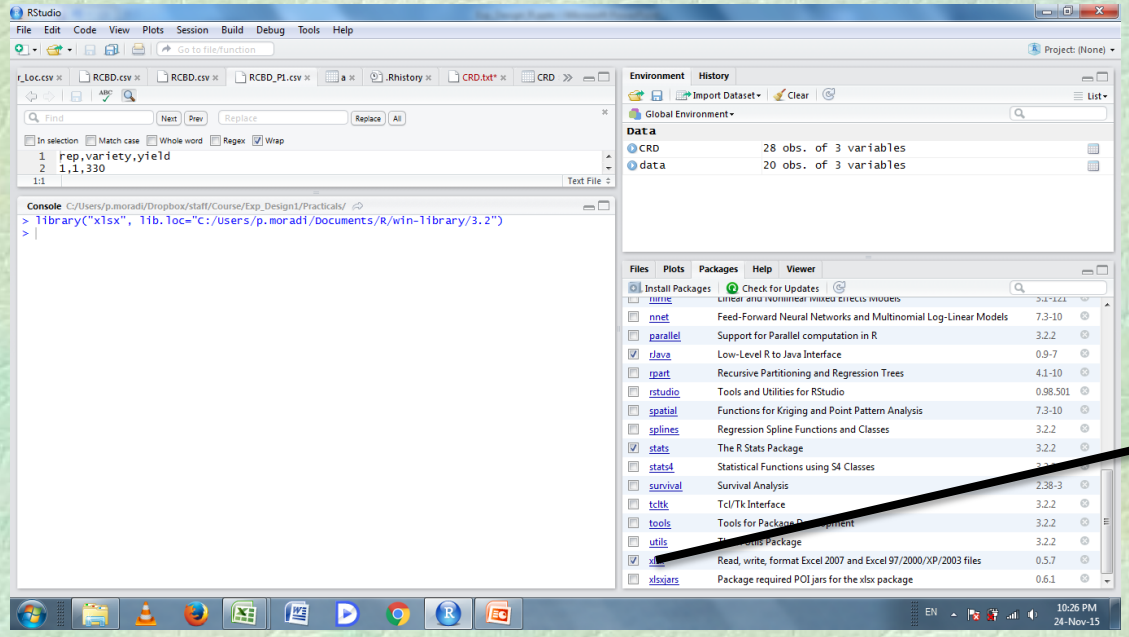
[PDF] Package 'xlsxjars' - CRAN
https://cran.r-project.org/web/packages/xlsxjars/xlsxjars.pdf R
Aug 22, 2014 - Package 'xlsxjars'. February 20, 2015. Type Package. Title Package required POI jars for the xlsx package. Version 0.6.1. Date 2014-08-21.

CRAN Package Check Results for Package xlsxjars
https://cran.r-project.org/web/checks/check_results_xlsxjars.html R
CRAN Package Check Results for Package xlsxjars. Last updated on 2015-10-28

۲– دانلود و نصب پکیج xlsxjars



۳– دانلود و نصب پکیج xlsx



۴– در لیست packages بسته xlsx را تیک می زنیم تا به این نحو این بسته لود می شود.

```
data=read.xlsx("CRD.xlsx", 1, header=T)
```