Introduction to R / RStudio

W 2015

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R Language/Environment

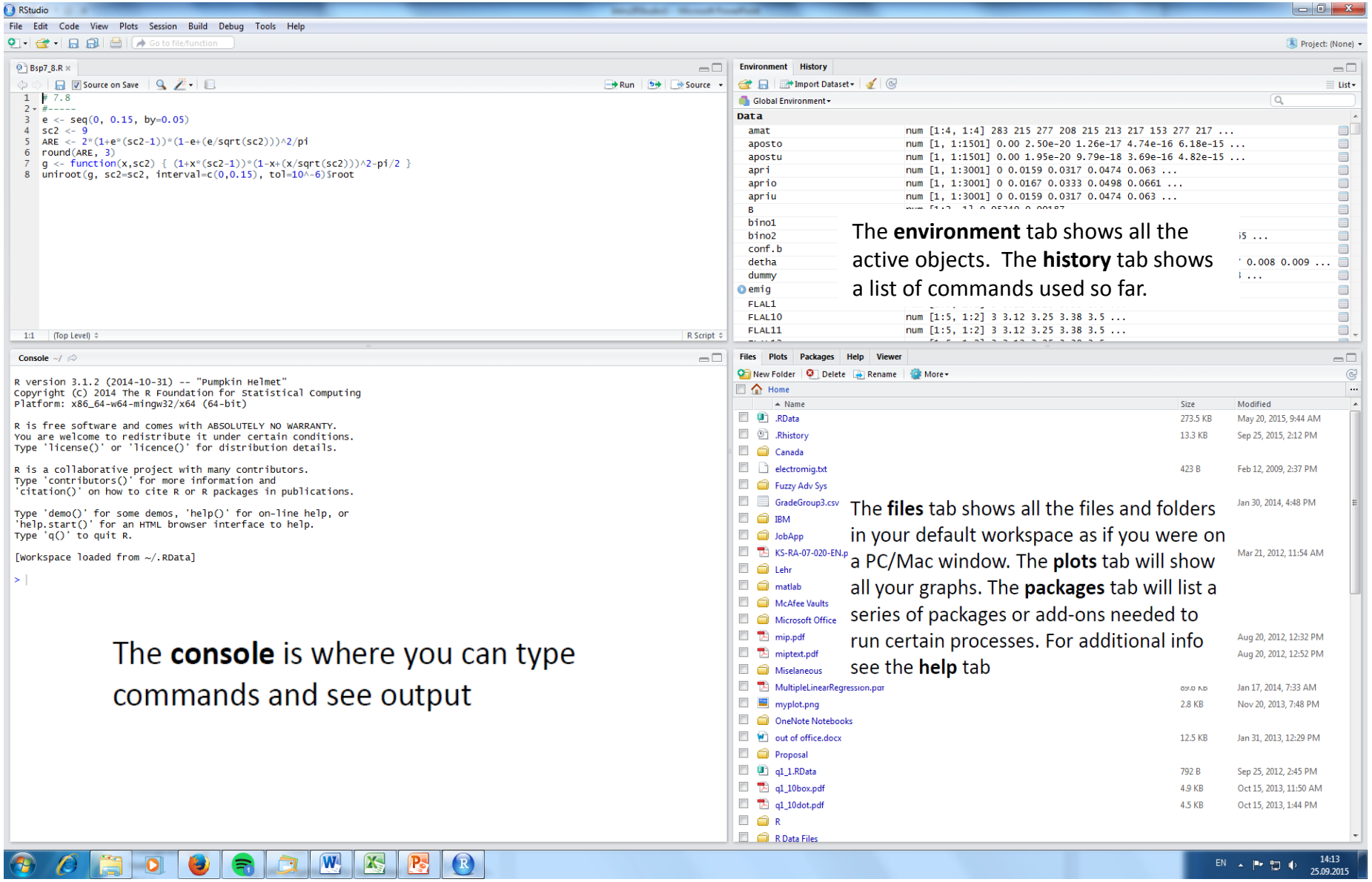
- Download and Installation
  - R homepage (http://www.r-project.org/)
    - ✓ http://cran.at.r-project.org/
    - ✓ Current Version: 3.2.2 (2015-08-14)
  - RStudio (http://www.rstudio.com/)
- Help
  - help()
  - help.search("")

    > help(seq)

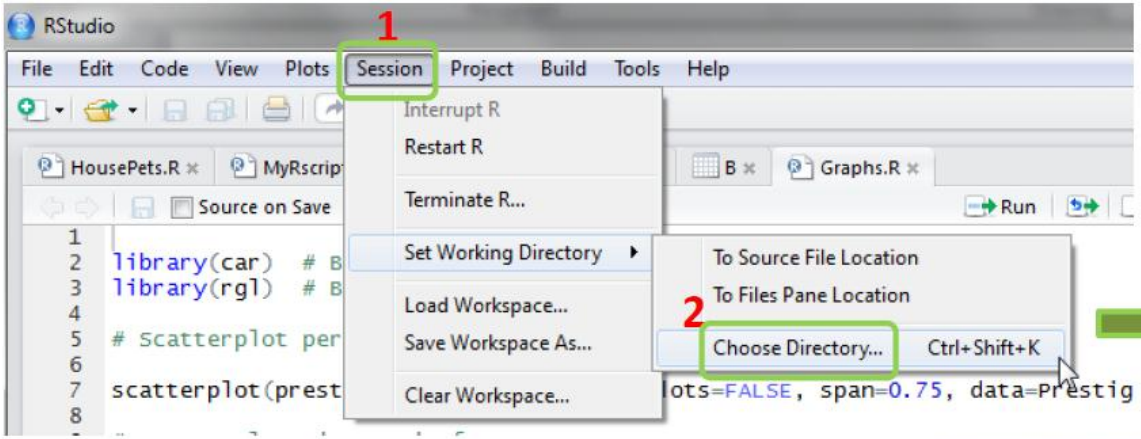
    > ?seq

    > example(persp)
  - On the Internet (Manual and/or Search)
    - http://cran.r-project.org/
    - http://www.rstudio.com/ide/docs/

RStudio screen

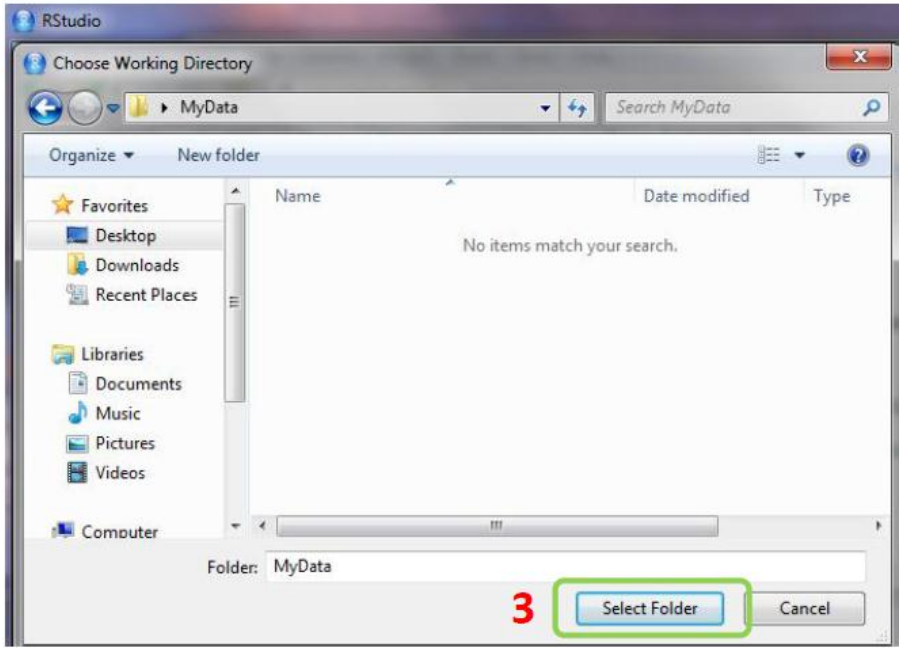


Changing the working directory

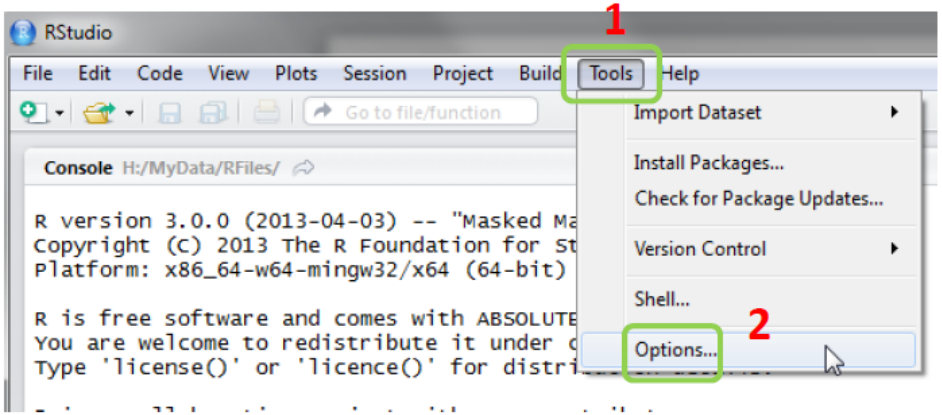


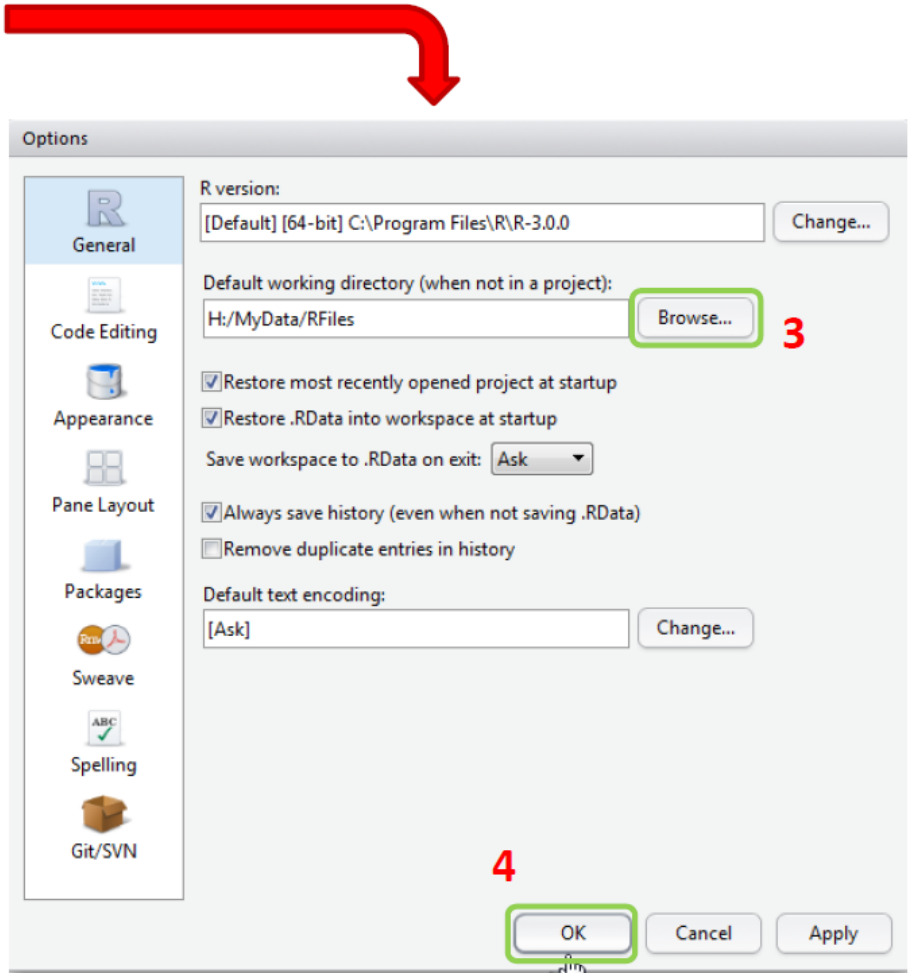
If you have different projects you can change the working directory for that session, see above. Or you can type:

```
# Shows the working directory (wd)

getwd()

# Changes the wd

setwd("C:/myfolder/data")
```



Setting a default working directory





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 (1)

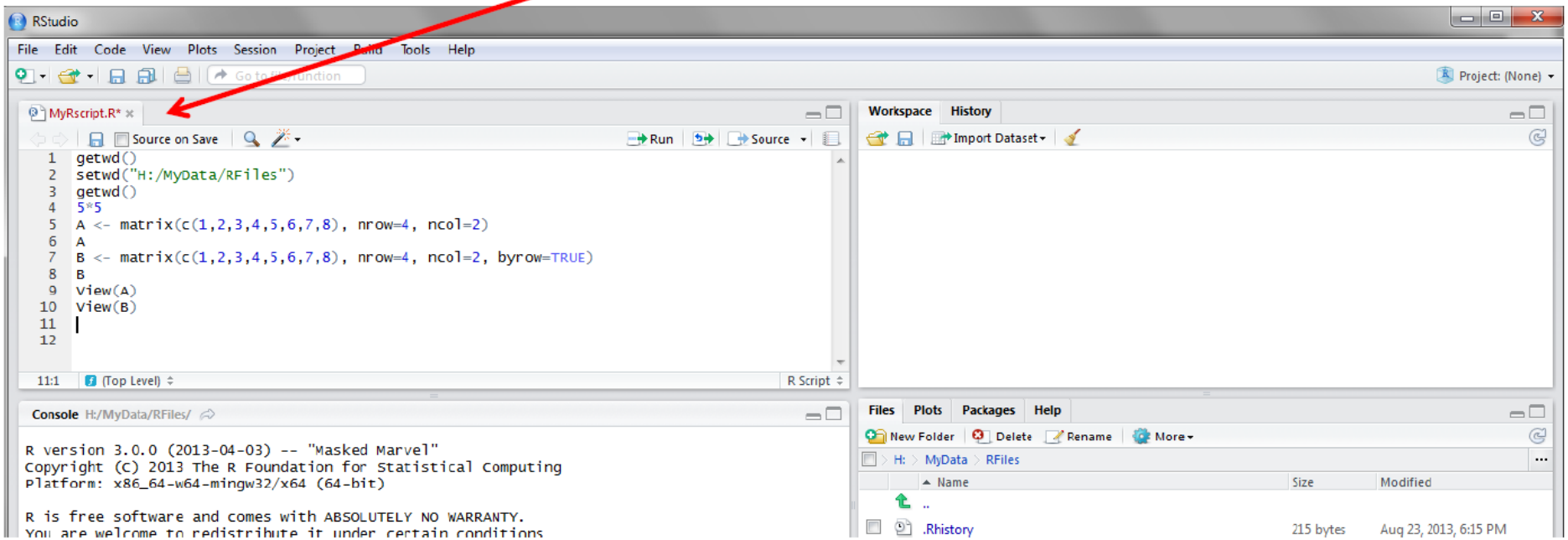
The usual Rstudio screen has four windows:

1.Console.

2.Workspace 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.



Plots tab

RStudio

File Edit Code View Plots Session Project Build Tools Help

HousePets.R | MyRscript.R | house.pets | A | B | Graphs.R*

Source on Save | Run | Source

```
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)
>
```

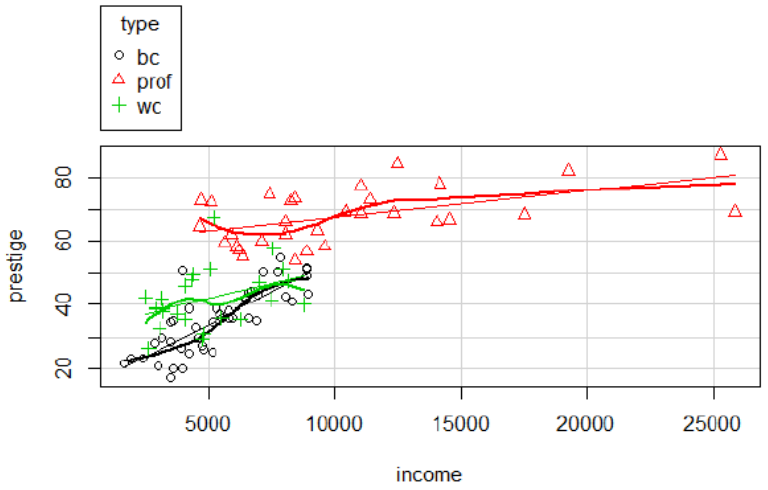
Workspace | History

Import Dataset

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]

Files | Plots | Packages | Help

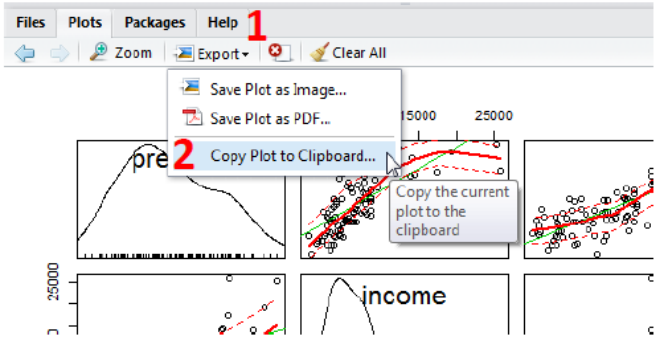
Zoom | Export | Clear All

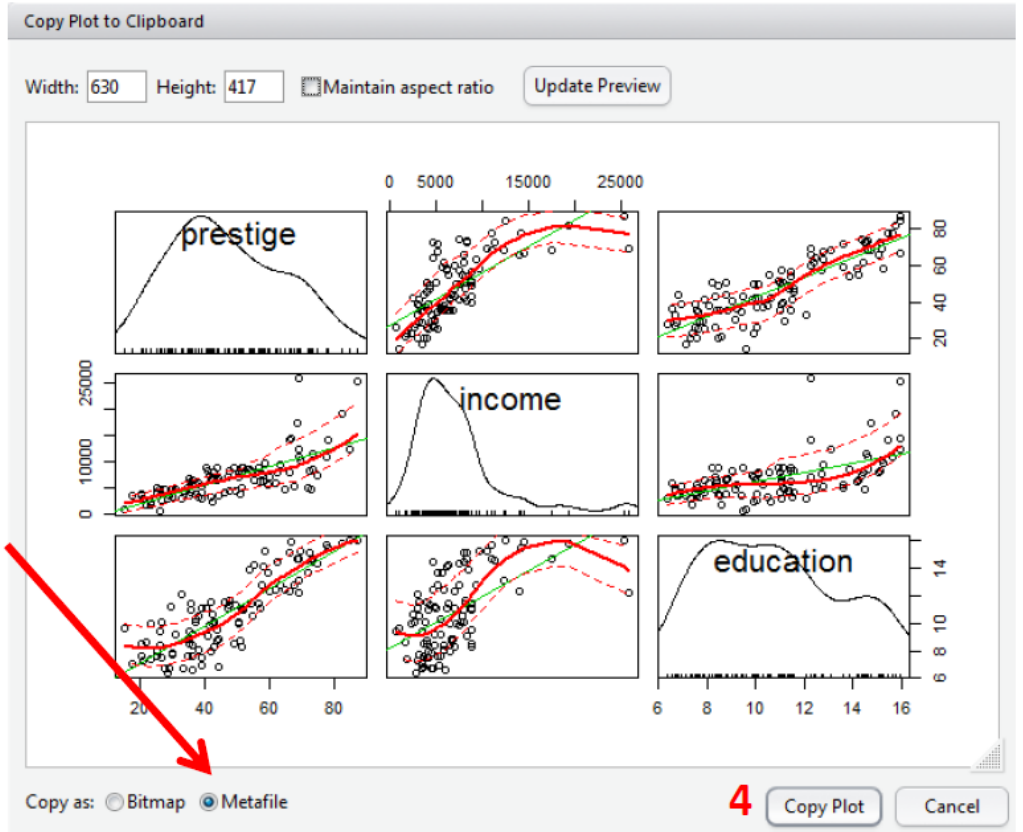


The **plots** tab will display the graphs. The one shown here is created by the command on line 7 in the script above.

Plots tab (2) – Graphs export

To extract the graph, click on “Export” where you can save the file as an image (PNG, JPG, etc.) or as PDF, these options are useful when you only want to share the graph or use it in a LaTeX document. Probably, the easiest way to export a graph is by copying it to the clipboard and then paste it directly into your Word document.





3 Make sure to select ‘Metafile’

5 Paste it into your Word document

Data Structures (1)

- Scalar – a single number (0-dimensional)
- Vector – a row of numbers (1-dimensional)
- Matrix – like a table (2-dimensional vector)
- Data frame – a matrix with names above the columns

```
> vec1 = c(1,4,6,8,10)
> vec1
[1]  1  4  6  8 10
> vec1[5]
[1] 10
> vec1[3] = 12
> vec1
[1]  1  4 12  8 10
> vec2 = seq(from=0, to=1, length=5)
> vec2
[1] 0.00 0.25 0.50 0.75 1.00
> sum(vec1)
[1] 35
> vec1 + vec2
[1]  1.00 4.25 12.50 8.75 11.00
```

```
mat=matrix(data=c(9,2,3,4,5,6),ncol=3)
> mat
     [,1] [,2] [,3]
[1,]    9    3    5
[2,]    2    4    6
```

```
> mat[1,2]
[1] 3
> mat[2,]
[1] 2 4 6
> mean(mat)
[1] 4.8333
```

Data Structures (2)

Data frame

```
> t = data.frame(x = c(11,12,14),
 y = c(19,20,21), z = c(10,9,7))
> t
   x y z
1 11 19 10
2 12 20 9
3 14 21 7
> mean(t$z)
[1] 8.666667
> mean(t[["z"]])
[1] 8.666667
```

List – more like a collection of vectors

```
> L = list(one=1, two=c(1,2),
 five=seq(1, 4, length=5))
> L
$one
[1] 1
$two
[1] 1 2
$five
[1] 1.00 1.75 2.50 3.25 4.00
> names(L)
[1] "one"  "two"  "five"
> L$five + 10
[1] 11.00 11.75 12.50 13.25 14.00
```

Functions

- Direct calculation
- Automated functions
- Self-defined functions

```
> (3+4+5)/3
```

```
> mean(x=b)
```

```
> rnorm(10)
[1] -0.949  1.342 -0.474 0.403
[5] -0.091 -0.379  1.015  0.740
[9] -0.639  0.950
```

```
> rnorm(10, mean=1.2, sd=3.4)
```

Programming tools (1)

- If-statement --- certain computation (something else) should only be done when a certain condition is (not) met

```
1 > w = 3
2 > if( w < 5 )
3     {
4     d=2
5     }else{
6     d=10
7     }
8 > d
9 2
```

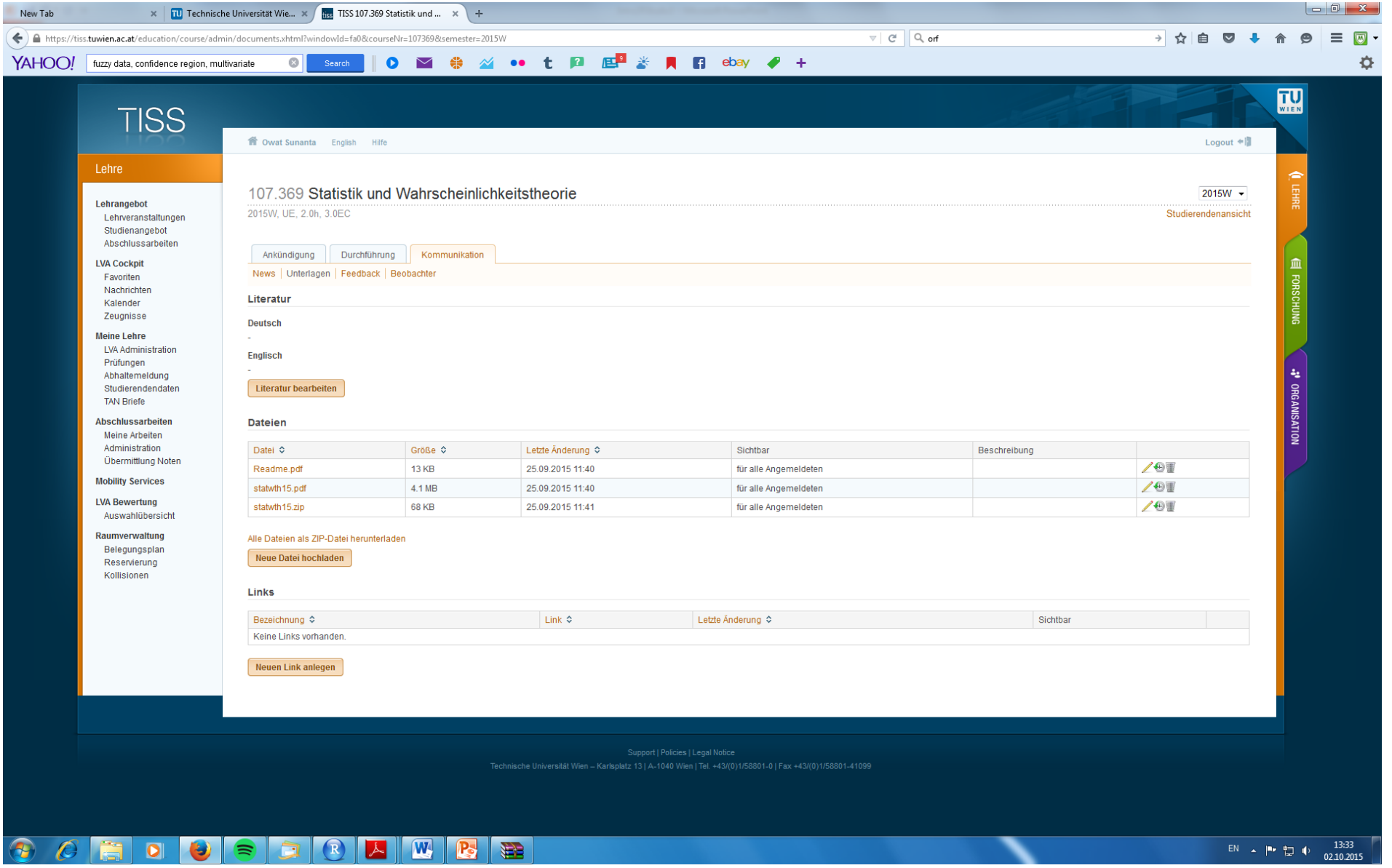
Programming tools (2)

- For-loop – to avoid typing the same commands over and over again

```
1 > h = seq(from = 1, to = 8)
2 > s = c()
3 > for(i in 2:10)
4    {
5    s[i] = h[i] * 10
6    }
7 > s
8 [1] NA 20 30 40 50 60 70 80 NA NA
```

Writing your own functions

```
1 > fun1 = function(arg1, arg2 )
2     {
3     w = arg1 ^ 2
4     return(arg2 + w)
5     }
6 > fun1(arg1 = 3, arg2 = 5)
7 [1] 14
8
```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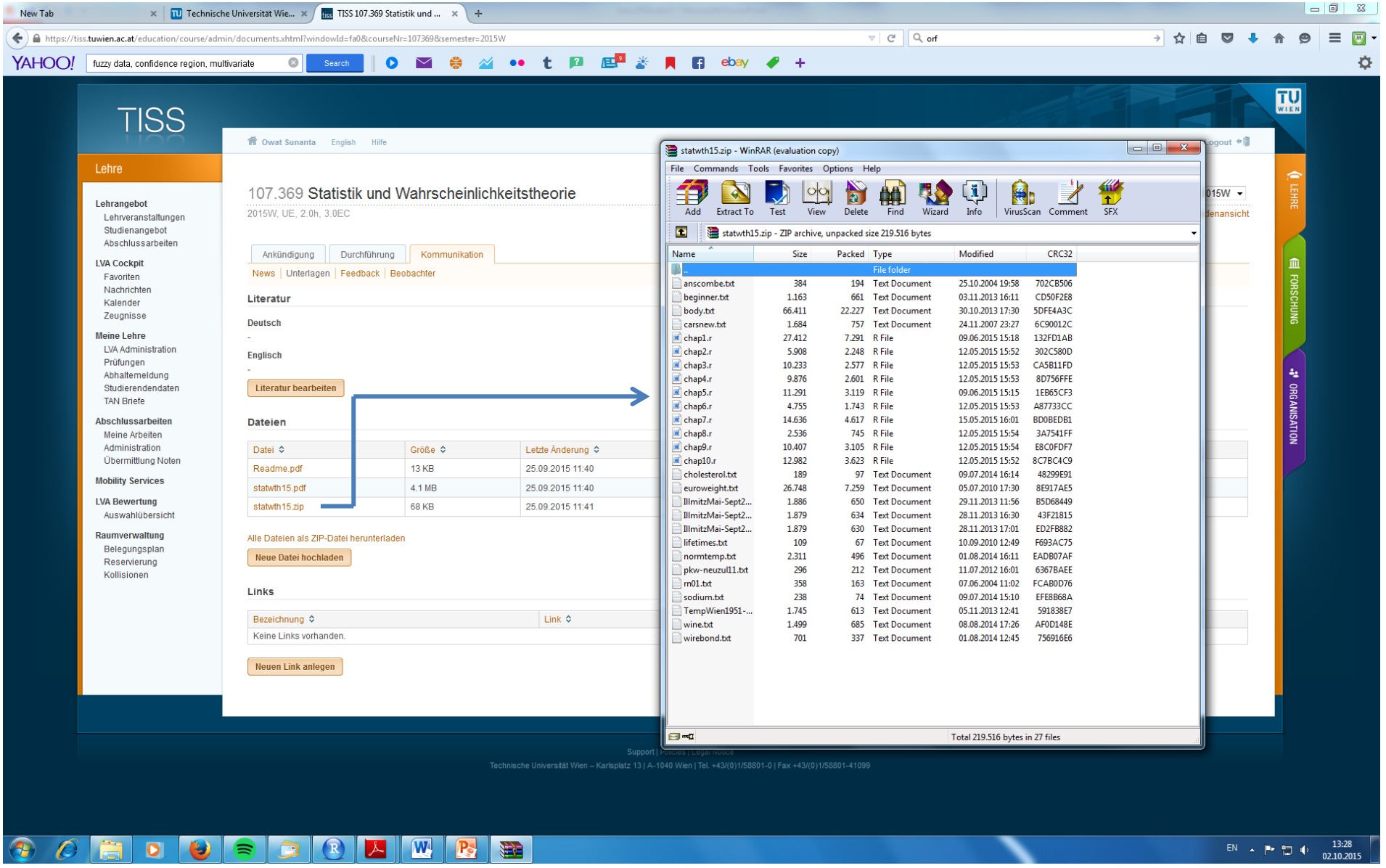
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Delete
Find
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Info
VirusScan
Comment
SFX
statwth15.zip - ZIP archive, unpacked size 219.516 bytes
Name
Size
Packed
Type
Modified
CRC32
File folder
anscombe.txt 384 194 Text Document 25.10.2004 19:58 702CB506
beginner.txt 1.163 661 Text Document 03.11.2013 16:11 CD50F2E8
body.txt 66.411 22.227 Text Document 30.10.2013 17:30 5DFE4A3C
carsnew.txt 1.684 757 Text Document 24.11.2007 23:27 6C90012C
chap1.r 27.412 7.291 R File 09.06.2015 15:18 132FD1AB
chap2.r 5.908 2.248 R File 12.05.2015 15:52 302C580D
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IllmitzMai-Sept2... 1.879 634 Text Document 28.11.2013 16:30 43F21815
IllmitzMai-Sept2... 1.879 630 Text Document 28.11.2013 17:01 ED2FB882
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normtemp.txt 2.311 496 Text Document 01.08.2014 16:11 EADB07AF
pkw-neuzul11.txt 296 212 Text Document 11.07.2012 16:01 6367BAEE
rn01.txt 358 163 Text Document 07.06.2004 11:02 FCAB0D76
sodium.txt 238 74 Text Document 09.07.2014 15:10 EFE8B68A
TempWien1951-... 1.745 613 Text Document 05.11.2013 12:41 591838E7
wine.txt 1.499 685 Text Document 08.08.2014 17:26 AF0D148E
wirebond.txt 701 337 Text Document 01.08.2014 12:45 756916E6
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References

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- Torfs, P. and Brauer, C., A (very) short introduction to R, Wageningen University, the Netherlands, 2012
- Gurker, W., Statistik und Wahrscheinlichkeitstheorie: Unterlagen zur Übung, Inst. f. Statistik u. Wahrscheinlichkeitstheorie, TU-Wien, 2014

Recommended Reading

Dalgaard, Peter, Introductory Statistics with R, 2nd Edition, 2008, Springer, New York.