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Statistical Programming in the Clinical Sciences

Install R

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1 Why R

R is a progamming language for statistical computing. It provides an environment for a wide variety of statistical analysis and graphics.

There are actually many reasons to use R. First of all, R is free to use with **open source code** and it runs on every operating system (Windows, Mac, Linux). Besides high-quality statistics, R also provides tools to produce all kinds of graphics that can be personalized to an arbitrary degree and can fulfill all demands for a publication.
Moreover, R increases the **reproducibility** of research findings since R code can be shared and re-run by other researchers and the exact same statistical analysis can be recalculated. RStudio offers tools that make this process easy. As a result, research becomes a transparent process.

Once developed, any R code can also easily be adapted or **extended** for other statistical analysis projects. Many other statistical softwares lack the range of possibilities that R is providing. It is very flexible and extensible. Additionally, R is compatible/connectable to other languages and has the reputation of beeing stable and reliable.

R is **easy to learn** by its **intuitive programming** concepts. At first sight, non-programmers need to get used to the idea of statistical programming, but our experience has shown that there is a steep learning curve. Moreover, the R and RStudio communities are quite large and very active. This community is not only working on the extension of the functionality of R, but is also helpful in supporting beginners by answering questions.

2   Installation

In this guide, R together with the editor RStudio is introduced. To be precise, R is the actual programming language, but the user is writing the code in an editor, e.g. RStudio. Running the code means that the editor RStudio sends the code behind the scene to R which then sends the results back to RStudio.

To get R and RStudio running, first you need to install R then subsequently the editor RStudio for the actual coding.

2.1   Windows

Current computers can have two kinds of architectures: 32-bit or 64-bit systems. It is therefore recommended that you use the R build (RStudio respectively) consistent to your hardware and operating system. In Section 2.1.1 *Finding your architecture* is an instruction to find out which kind of architecture is implemented in your computer.

2.1.1   Finding your architecture

To find out which system you have running, hold the *"Windows Key"* and press *"r"*. Write in the dialog *"msinfo32"* and press *"OK"* (Figure 1).
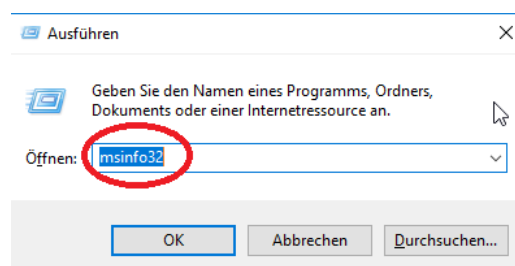

Figure 1: Windows - msinfo32.

Under the dialog *"Systemübersicht"* ("System Summary") you find the panel *"Systemtyp"* ("System Type") and the information whether you have a 32 or 64-bit system, see Figure 2.

If you have trouble to find out whether you have a 32 or 64-bit system, you can simply install the x32 version. Currently, 64-bit Windows systems also supports 32-bit applications.
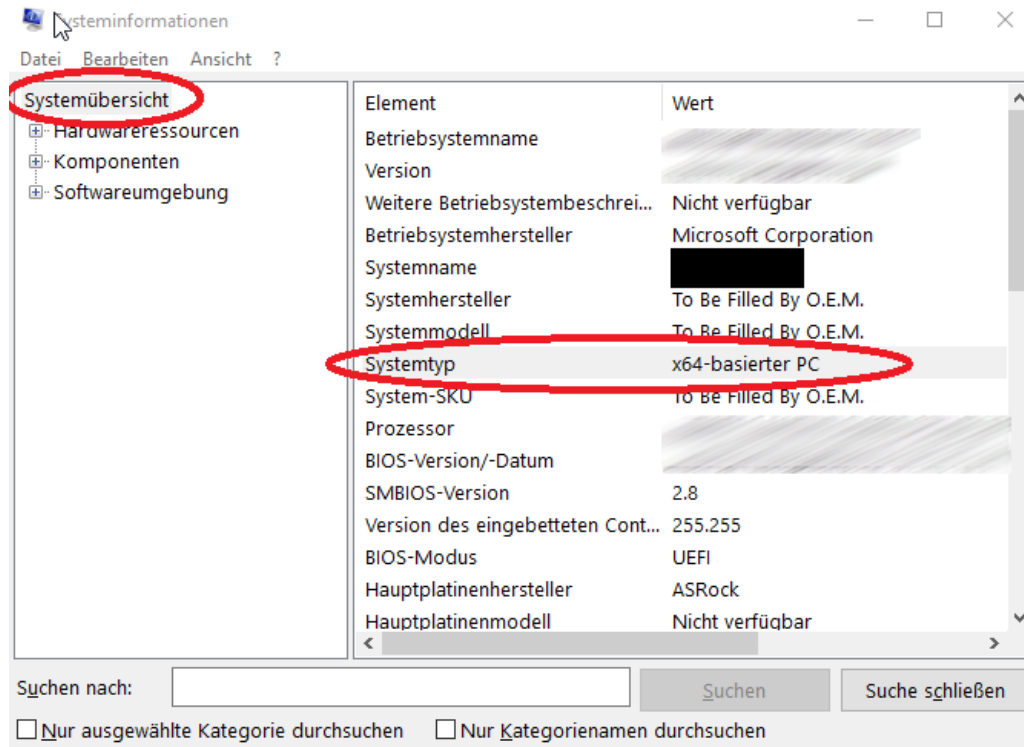
Figure 2: Windows - System Overview.

2.1.2   Installing R

To install R visit the website https://stat.ethz.ch/CRAN/. Click on the link for your operating system and and choose *"base"*. Download the latest version by clicking on the link *"Download R X.X.X for Windows"* at the top of the website (the *"X.X.X"* is a placeholder for the actual version number). After the download completed, open the *.exe* file and follow the installation guide. Do not change the target directory, otherwise RStudio may not find R automatically.

2.1.3   RStudio

To download RStudio go to the website `https://www.rstudio.com/products/rstudio/download/ #download`. You need *"RStudio Desktop - Open Source License"* which can be downloaded without payment. Go to the section *"Installers for Supported Platforms"* and download the version for your operating system. Open the *.exe* file and follow the installation instructions.

2.2   Mac OS

Current computers can have two kinds of architectures: 32-bit or 64-bit systems. It is therefore recommended that you use the R build (RStudio respectively) which is consistent to your hardware and operating system. In Section 2.2.1 *Finding your architecture* is an instruction to find out which kind of architecture is implemented in your computer.

2.2.1   Finding your architecture

Before the acutal installing you should find out whether you have a 32-bit or 64-bit system.

Click on the Apple menu in the top left corner. Then click on *"Über diesen Mac"* (*"About This Mac"*). Under the dialog *"Systemübersicht"* (*"System Summary"*) you find the panel *"Systemtyp"* (*"System Type"*) and the information whether you have a 32 or 64-bit system (Figure 3).

Figure 3: Mac - About this Mac.

If you have one of the processors in the following list, then you have a 64-bit processor:

- Intel Core Solo, Intel Core Duo, Intel Core 2 Duo
- Dual-core Xeon, Quad-core Xeon
- Core i3, Core i5, Core i7

If you have trouble to find out whether you have a 32 or 64-bit system, you can simply install the x32 version. Currently, 64-bit Mac systems also support 32-bit applications.

2.2.2   Installing R

To install R visit the website https://stat.ethz.ch/CRAN/. Click on the link for your operating system *"Download R for (Mac) OS X"*. Among other information you find there the download link *"R-X.X.X.pkg"* (make sure that it is compatible with your Mac OS version. You can find out the version of your Mac OS by clicking on the Apple menu in the top left corner, then click on *"Über diesen Mac"* (*"About This Mac"*)). Double click on the .pkg file after the download has completed and follow the instructions (Figure 4). Do not change the target directory, otherwise RStudio may not find R automatically.

2.2.3   RStudio

To download RStudio go to the website `https://www.rstudio.com/products/rstudio/download/` `#download`. You need *"RStudio Desktop - Open Source License"* which can be downloaded without payment. Go to the section *"Installers for Supported Platforms"* and download the version for your operating system. Open the .dmg file and follow the installation guide.
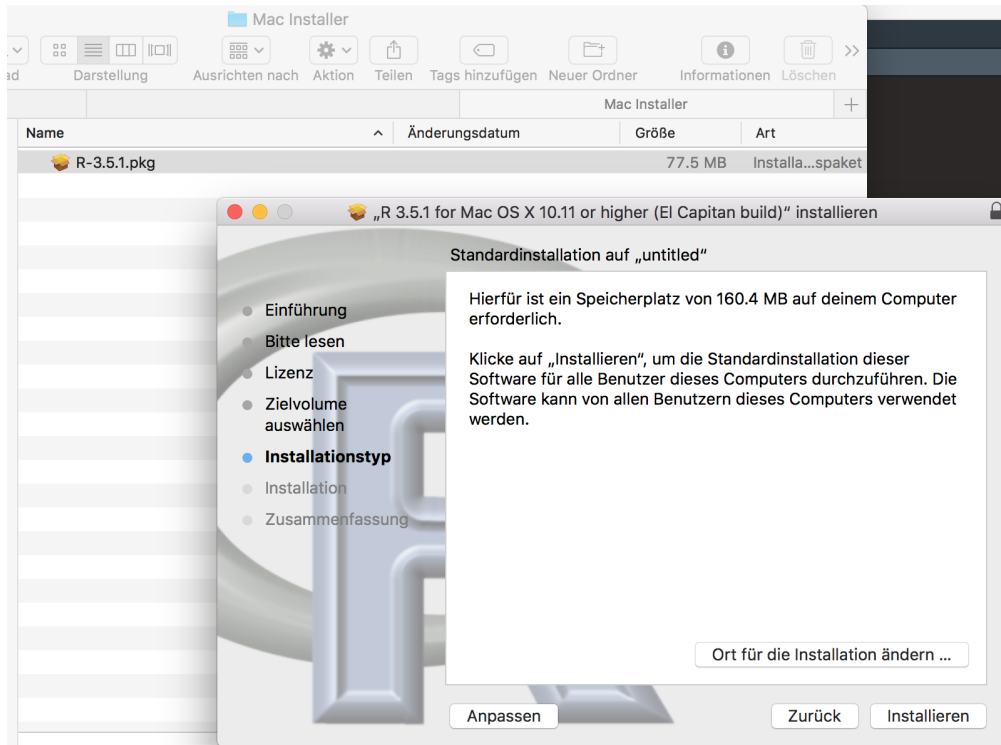
Figure 4: Mac - Installation of R.

3 Get to know R and RStudio

Read *"Get to know R"* to get started with R and RStudio. There you will find a first overview and an explanation of the basic concepts.

4 References

R Core Team (2021). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.
URL https://www.R-project.org/

R version and packages used to generate this report:
R version: R version 4.1.2 (2021-11-01)
Base packages: stats, graphics, grDevices, utils, datasets, methods, base
Other packages: reporttools 1.1.3, xtable 1.8-4, knitr 1.37
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