

The aim of this document is to help you, an undergraduate student in an introductory statistics course, learn to use the software R as part of your learning of statistics.

This material has been first and mainly written by Bret Larget in the Falls 2002 and 2003. The most recent version of R has changed since then, but its basic use has not. This document might evolve as the semester progresses. Feedback from you is particularly welcome, as it will help me make this document clearer for you and future students. Good luck!

## What is R?

R is powerful software for interacting with data. With R you can create sophisticated graphs, you can carryout statistical analyses, and you can create and run simulations. R is also a programming language with an extensive set of built-in functions, so you can, with some experience, extend the language and write your own code to build your own statistical tools. Advanced users can even incorporate functions written in other languages, such as C, C++, and Fortran.

The S language has been around for more than twenty years and has been the most widely-used statistical software in departments of statistics for most of that time, first as S and then as the commercially available S-plus. R is an open source implementation of the S language that is now a viable alternative to S-plus, and in fact, has many advantages. A core team of statisticians and many other contributors work to update and improve R and to make versions that run well under all of the most popular operating systems. Most importantly to you, R is free, high-quality statistical software that will be useful as you learn statistics even though it is also a first-rate tool for professional statisticians.

## Why use R for introductory statistics?

There are several reasons that make R an excellent choice of statistical software for an introductory statistical course. First, R is free and available on the Web. You can use it on your home computers and are not tied to campus labs. Second, R is a powerful, widely-used software. The knowledge of R you gain during the course potentially translates to a marketable skill. You will learn to use a tool that has many practical uses outside the classroom. Third, even though it is not the simplest statistical software, the basics are easy enough to master that learning to use R need not interfere overly much with learning the statistical concepts encountered in an introductory course. Fourth, did I mention that it is free and you can use it at home?

The primary drawback to using R in an introductory course is that most existing documentation for R is written for an audience that is knowledgeable about statistics and has experience with other statistical computing programs. In contrast, this document intends to make R accessible to the typical student in an introductory statistics course who is new to both statistical concepts and statistical computing. The aim is to teach you how to install R on your home computer and to teach you to use R to learn the statistical concepts usually included in an introductory course with explanations and examples aimed at the appropriate level. This document purposely does not attempt to teach you about R's advanced features. The intention is to teach you enough R to enhance your learning of introductory statistics and to point you in the direction of more information should you find a desire to learn more.

Installing R on your computer is simple if you have clear directions that tell you exactly what to do in a way that is easy to understand. Directions exist at the R website <http://cran.r-project.org/> for installing R, but many students may have difficulty determining which files they need to download and then how to install them. Here are more explicit instructions that tell you what to do.

## Obtaining the software

There are two options for installing the software: downloading it from the Web or installing from a prepared CD. I recommend that you download the software. If this fails, you may borrow a CD from me. In either case, there is only one file that you need to obtain (different depending on the operating system). Running this file begins the installation process which is straight-forward.

### Downloading R from the Web

Go the R homepage at <http://cran.us.r-project.org/>. This server is actually located here in Madison.

**Windows (95 or later)** Click on the link **Windows (95 and later)**, then click on the link **base/**, and finally click on **R-2.2.1-win32.exe**. (or the most recent version which could have a larger number). This begins the download of a file whose size is about 25MB. After the download is complete, double click on the downloaded file and follow the on screen installation instructions.

**Macintosh** Depending on your system, click on the link

- **MacOS X (10.2.x and above)**, then click on **powerpc/R-2.2.1.dmg** (latest version) which begins the download.
- **MacOS (System 8.6 to 9.1 and MacOS X up to 10.1.x)**, then click on **rm171.sit** which begins the download. When given a choice to unstuff or save, choose save and save it on your desktop. Double click on the downloaded file. You Mac will unstuff the downloaded file and create an R folder. Inside this folder, there are many files including one with the R logo. I suggest that you would drag a copy of this to your panel and then drag the whole R folder to the Applications folder (located on the hard drive). After completing this, you can drag the original downloaded file to your trash bin.

### Loading R from a CD onto a PC

Insert the CD into the drive, open the CD (from My Computer using the Windows operating system) and double click on the **R-2.2.1-win32.exe** icon to begin installation. Follow the on screen installation instructions.