## Brief History of R

- S: language for data analysis developed at Bell Labs circa 1976
- Licensed by *AT&T/Lucent* to *Insightful Corp*. Product name: *S-plus*.
- R: initially written & released as an open source software by Ross Ihaka and Robert Gentleman at U Auckland during 90s (R plays on name “S”)
- Since 1997: international R-core team ~15 people & 1000s of code writers and statisticians happy to share their libraries! AWESOME!

## R is an “Open source” program

- You don’t have to pay for it and it:
  - Provides full access to algorithms and their implementation
  - Gives you the ability to fix bugs and extend software
  - Provides a forum allowing researchers to explore and expand the methods used to analyze data

R is an interpreted computer language.

– R is used for data manipulation, statistics, and graphics. It is made up of:
- operators (`+ - <- * %*%` ...) for calculations on arrays & matrices
- large collection of functions
- user written functions & sets of functions (packages);

– Most user-visible functions are written in R itself, calling upon a smaller set of internal primitives.

– It is possible to interface procedures written in C, C+, or FORTRAN languages for efficiency, and to write additional primitives.

There are over 800 add-on packages

(http://cran.r-project.org/src/contrib/PACKAGES.html)

> This is an enormous advantage - new techniques available without delay, and they can be performed using the R language you already know **but** as the number of packages grows, it is becoming difficult to choose the best package for your needs.

## Learning R

- Read through the CRAN website
- Use google or http://www.rseek.org/
- Many books (and pdf files)
- Lots of videos: http://www.youtube.com/watch?v=1jI9OKnjQHs

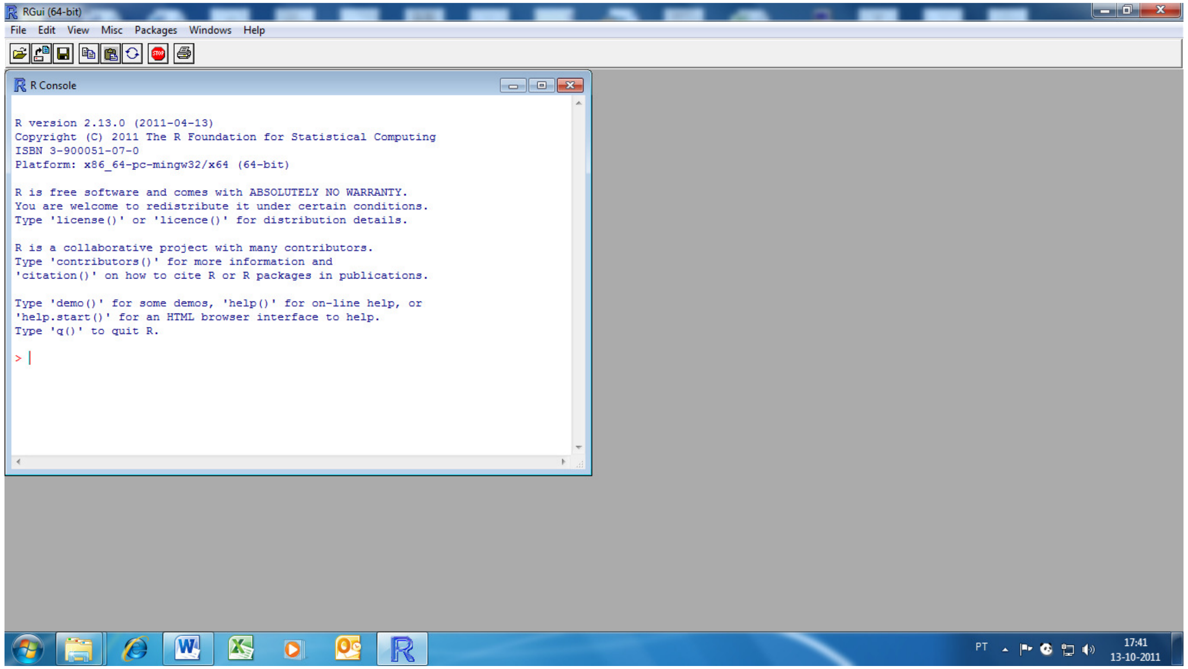
## How to get R:

The Comprehensive R Archive Network (CRAN) at http://www.r-project.org or google it.

Download the executable file and it will install itself

## How to start R:

Double click R icon on your desktop or use the start button



```
R version 2.13.0 (2011-04-13)
Copyright (C) 2011 The R Foundation for Statistical Computing
ISBN 3-900051-07-0
Platform: x86_64-pc-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.

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.

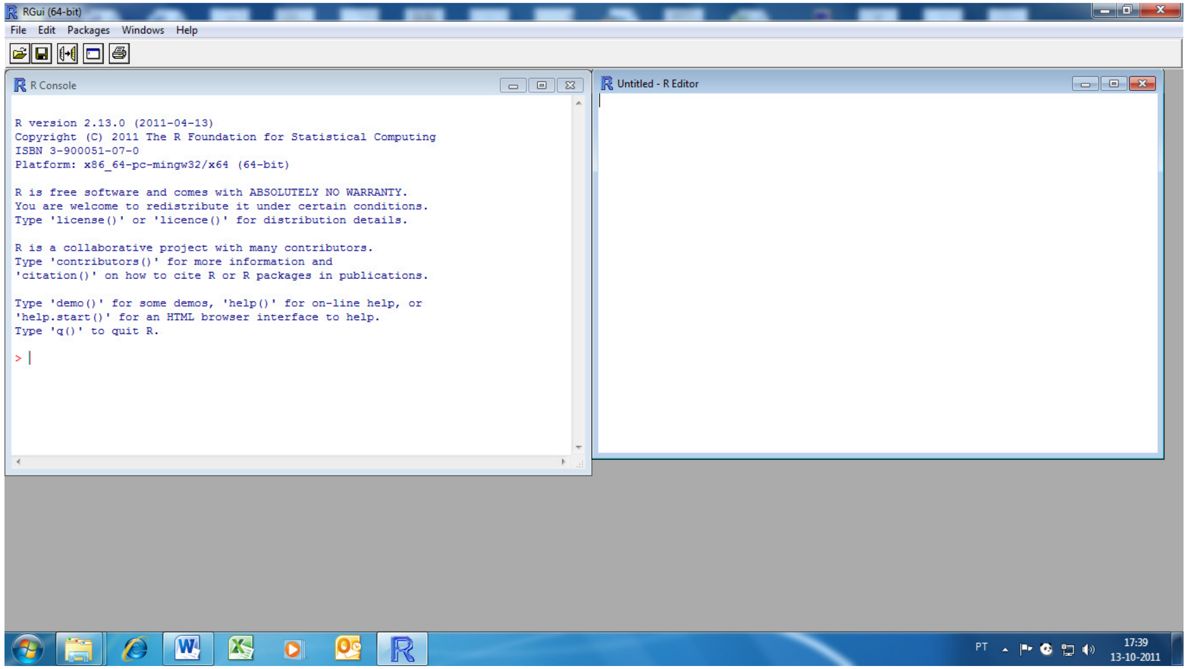
> 
```

R is an interactive program: you type commands and you obtain answers

Examples

While one can type R commands one line at a time directly into the R console this is not at all efficient for writing programs. So instead most users type R commands into a text editor and then copy and paste them into R.

Menu: File / script file (new or open)



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>
```

Some preliminaries on entering commands:

- Expressions and commands in R are case-sensitive.
- Command lines do not need to be separated by any special character but if you write two or more commands in the same line you must separate them using a semicolon

- Anything following the character (#) is ignored by R – considered as a comment.
- An object name must start with an alphabetical character, but may contain numeric characters thereafter. A period may also form part of the name of an object. For example, x.1 is a valid name for an object in R.
- You can use the arrow keys on the keyboard to scroll back to previous commands.

Some exercises

1) Store  the values 0.90, 0.93, 0.8, 0.95, and 0.91 in a vector named "s"; calculate the number of items stored in "s"; calculate the mean of the values in "s"; calculate the cumulative product of the values in "s";

2) Generate 50 random numbers from a uniform (0,1) distribution (command runif) and store the values in an array named “x”. Use R to determine how many values are less than 0.3 and to identify the positions of these elements.

3) Use R to compute $\sum_{i=1}^{50} x_i^2$, $\sum_{i=1}^{50} x_i\,(2x_i - 1)$, $(1+r)^t$ for $t = 0, 1, \cdots, 50$ (try different values for $r$)

4) To compute 5! (factorial of 5). In a practical situation you can use the R command factorial(5) but the point here is to compute 5! without using the command.

5) Create an array v=(1; 5; 9; 13) using command seq.