Intro to R - the Language

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What is R?
RStudio Layout
Using R
Further Resources

Intro
Why use R?
Installation

What is R?

- R is a language and environment for statistical computing and graphics.
  - From R's website
- Note that it is a **language**
  - Those of you who have learned a foreign language know how slow and frustrating that process is. . .

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Advantages of R

- It's **FREE**, open-source, and available on every platform
  - Stata is between \$55/yr and \$1000/year for students, depending on what you need
- Unparalleled in the number of statistical packages (groups of functions)
- Great community help (e.g. stackoverflow.com, R-bloggers)
- You can combine documents and r code together (rmarkdown or knitr)
  - For example, this presentation is written in rmarkdown

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Disadvantages of R

- Some feel like it's not as intuitive as Stata or other stats programs
- Uses lots of memory
- If you know another programming language (C, Python, etc), R's syntax is very odd
- Since anyone can write a package, some of the code (and help files) are difficult to follow

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R

- Go to www.r-project.org, click "Download R," select a mirror close to you, and select your operating system
- R by itself is pretty dinky, so we like to use RStudio

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RStudio

- Go to www.rstudio.com and download the appropriate desktop version of Rstudio (the free one)
- Install like normal
- Open RStudio, click tools > global options and change "Save workspace to RData on exit" to Never

RStudio Layout

- Bottom left: Console
  - This is where you can enter R code to execute
- Top left: editor window
  - You can have open R scripts or rmarkdown files here to edit
- Top right: environment, history, (git)
  - Environment will list everything that R is "remembering"
  - History lists all commands entered in that "project"
- Bottom right: files, plots, packages, help

R Projects

- You can set up different "projects" from within Rstudio
- This will automatically change the working directory to where you put the project
- I use a project for each paper, for example

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Calculator

- R is a great calculator

```
3 + 2
```

```
## [1] 5
```

```
1.7729^4 * (1930/4)
```

```
## [1] 4766.881
```

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Assignment

R uses <- for assignment.

```
a <- 4
a + 7
```

```
## [1] 11
```

```
a <- a + 2
a + 7
```

```
## [1] 13
```

a is now referred to as an "object." Pretty much anything R remembers is an object.

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Functions

Functions take arguments

```
myvector <- c(1, 5, 2, 7, 9, NA, 1)
mean(myvector, na.rm = TRUE)
```

```
## [1] 4.166667
```

```
rnorm(5, 0, 1)
```

```
## [1] -1.0035426 -0.1624631  0.0699952 -0.3364394  0.58529
```

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Basic Data Structures

R has four basic types of data: logical, numeric, integer, and character

```
TRUE ; FALSE
3
3L
"character"
```

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matrix

```
mymatrix <- matrix(c(1,2,3, 5,11,4), nrow=2, byrow=FALSE)
mymatrix
```

```
##      [,1] [,2] [,3]
## [1,]    1    3   11
## [2,]    2    5    4
```

```
mean(mymatrix[ , 1])
```

```
## [1] 1.5
```

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data.frame

```
mydata <- data.frame(x=c(1,2,3), y=c(5,11,4))
mydata
```

```
##   x  y
## 1 1  5
## 2 2 11
## 3 3  4
```

```
mean(mydata$x)
```

```
## [1] 2
```

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list

```r
mylist <- list(amatrix = mymatrix,
               adataframe = mydata)
mylist
```

```
## $amatrix
##      [,1] [,2] [,3]
## [1,]    1    3   11
## [2,]    2    5    4
##
## $adataframe
##   x  y
## 1 1  5
## 2 2 11
## 3 3  4
```

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If-else

If else statements say IF this is true, then do this. OTHERWISE, do that. There are two types in R: if, else (which work for scalars) and ifelse, which works on vectors

```r
x <- 1:10
if(5>3){
  x+1
}
```

```
##  [1]  2  3  4  5  6  7  8  9 10 11
```

```r
ifelse(x<=5, x+1, x-4)
```

```
##  [1] 2 3 4 5 6 2 3 4 5 6
```

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For loops

For loops do something a specified number of times:

```
x <- numeric()
for(i in 1:10){
  x[i] <- rnorm(1)
}
x
```

```
##  [1] -1.1340199 -0.9948561  0.2979159 -0.8607577  1.2023
##  [7] -1.1660828  1.9709767 -1.0024128  1.5322428
```

Further resources

- Importing data into R
- Useful R packages
- R tutorials on lynda.com (free for UT students)