# Introduction to R

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# Overview and History of R

- R is a dialect of the S language.
- S is a language that was developed by John Chambers and others at Bell Labs. S was initiated in 1976
- R was created in 1991 – by Rose Ihaka and Robert Gentleman
- In 1993 R was released to the public. 1997: R core group was formed 2000: R 1.0.0 was released
- We are using R version 3.1.2 (2014-10-31)

# Features of R

- Runs on almost any standard computing platform/OS (even on the PlayStation 3)
- Frequent releases (annual + bug_x releases); active development.
- Useful for interactive work, but contains a powerful programming language for developing new tools (user –> programmer)

# Feature of R

- Very active and vibrant user community; R-help and R-devel mailing lists and Stack Overflow – look at them on when at R help
- It's free! (Both in the sense of beer and in the sense of speech.)

# Setup Environment

- Download R from - The Comprehensive R Archive Network -`http://cran.r-project.org/` and R Studio
- Available for the key OS

**R-studio?** -RStudio is the premier integrated development environment for R. - Download and install from `http://www.rstudio.com/`

**Why R-studio?** - RStudio's source editor includes a variety of productivity enhancing features including syntax highlighting, code completion, multiple-file editing, and find/replace, retrieving prev commands

# Help Areas

- R Help Mailing List - https://stat.ethz.ch/mailman/listinfo/r-help
- R Commander - http://socserv.mcmaster.ca/jfox/Misc/Rcmdr/
- Quick R - http://www.statmethods.net/
- R CookBook - http://www.cookbook-r.com/
- R-Bloggers - http://www.r-bloggers.com/
- Inside R- http://www.inside-r.org/blogs
- Try R - http://tryr.codeschool.com/
- Video Tutorials - http://www.twotorials.com/
- Stack overflow About R - http://stackoverflow.com/tags/r/info
- Stack overflow R FAQ - http://stackoverflow.com/tags/r
- R google group - https://groups.google.com/forum/#!forum/r-help-archive

# Types of people in the world

- *There are **10 types of people** in this world, those who understand binary and those who dont*

# The Terms

- **Object** R is an object oriented language and everything in R is an object.
  - We store using <- or = operator ie x <- 3 | x=3
- **Vector** A collection of one or more objects of the same type . We use c() or vector()
- **Function** A set of instructions carried out on one or more objects.
  - function *mean()* is used to calculate the arithmetic mean
- **Operator** Is a symbol that has a pre-defined meaning. +*-/
- **Parameter** The kind of information that can be passed to a function – mean(age)

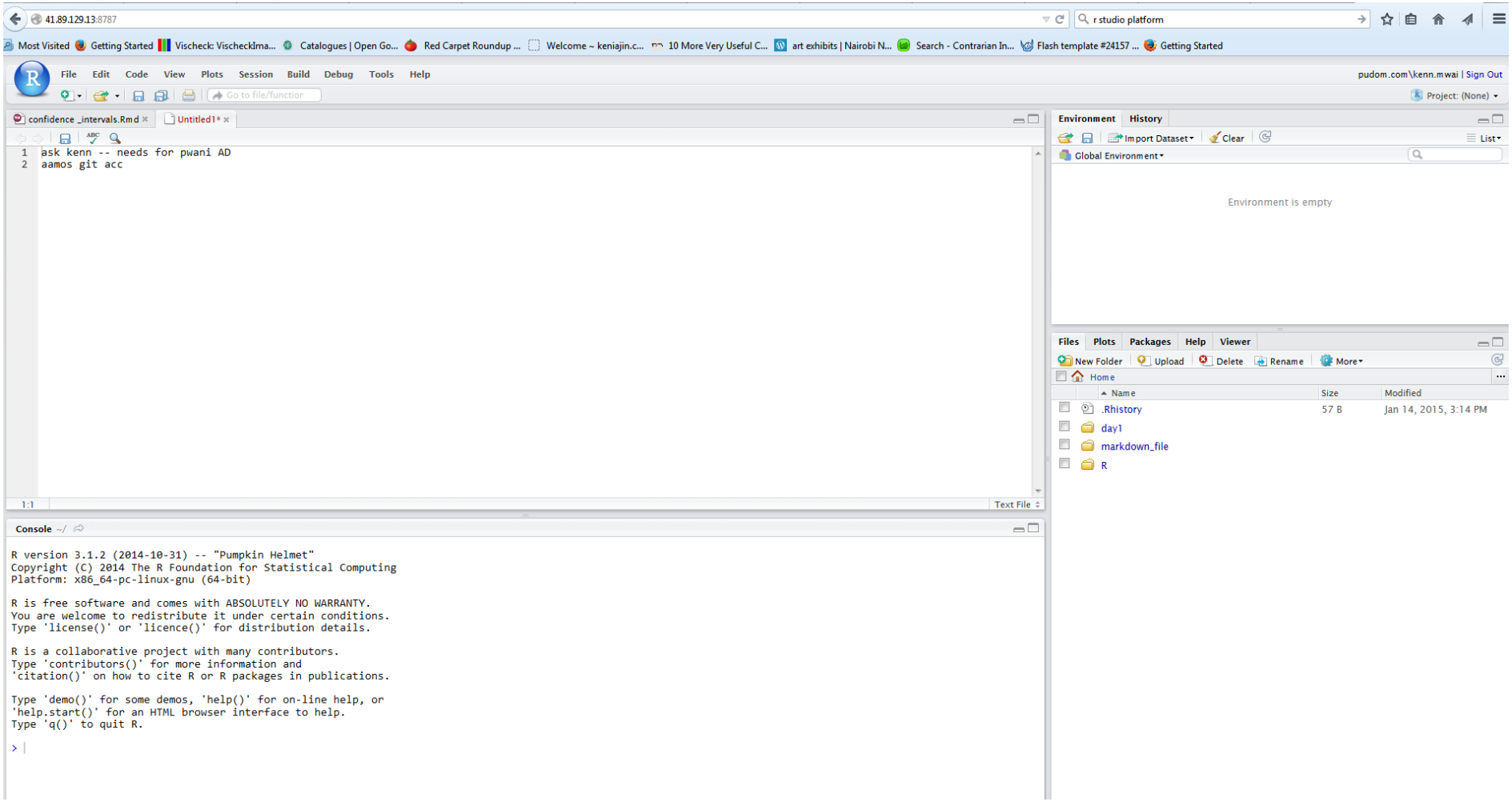
# Packages

- A set of functions designed to perform more specific statistical or graphical tasks examples and documentation.
- 4000+ packages found on the CRAN
- To use packages in R, we must first install them using the install.packages()

# Data Types / Classes

| Data Types | Stores |
|---|---|
| real | floating point numbers |
| integer | integers |
| complex | Complex numbers |
| factor | categorical data |
| character | strings |
| logical | TRUE or FALSe |
| NA | Missing |
| NULL | Empty |
| Function | Function type |

# RStudio Platform



# Vector

- A vector can only contain objects of the same class

```
a <- c(1,2,5.3,6,-2,4) # numeric vector
b <- c("one","two","three") # character vector
c <- c(TRUE,TRUE,TRUE,FALSE,TRUE,FALSE) #logical vector
```

# Matrices

- All columns in a matrix must have the same class(numeric, character, etc.) and the same length. The general format is

```
#     mymatrix <- matrix(vector, nrow=r, ncol=c, byrow=FALS
#     dimnames=list(char_vector_rownames, char_vector_c
#    byrow=TRUE indicates that the matrix should be filled by
```

# Factors

- Used to represent categorical data.
- Can be unordered or ordered. -A factor is like an integer vector where each integer has a label.

```
x <- factor(c("yes", "yes", "no", "yes", "no"))
x
```

```
## [1] yes yes no  yes no
## Levels: no yes
```

# Missing Values

- Missing values are represented by the symbol **NA** (not available)
- Impossible values (e.g., dividing by zero) are represented by the symbol NaN (not a number)
- Can be unordered or ordered. -A factor is like an integer vector where each integer has a label.

```
  x <- NA
 # is.na(x) # returns TRUE of x is missing
# mean(x, na.rm=TRUE) # exclude missing in functions
# complete.cases() #returns the number of complete cases
```

# Data Frames

- More general than a matrix, has different columns and can have different modes (numeric, character, factor, etc.)
- Used to store tabular data
- Can store data of different classes
- *read.table()* or *read.csv()* or *read.table()*– used to load dataframes

# Create Data Frames

```
data.frame(foo = 1:4, bar = c(T, T, F, F))
```

```
##   foo   bar
## 1   1  TRUE
## 2   2  TRUE
## 3   3 FALSE
## 4   4 FALSE
```

```
x <- c(1, 2,3,4,5,6,7,8,9)
y <- c("a","b","c","d","e","f","g","h","i")
df <- data.frame(x=x, y=y)
```

```r
print(df)
```

```
##   x y
## 1 1 a
## 2 2 b
## 3 3 c
## 4 4 d
## 5 5 e
## 6 6 f
## 7 7 g
## 8 8 h
## 9 9 i
```

```r
class(df)
```

```
## [1] "data.frame"
```

# Datasets

- R works with different types of datasets
- Base R functions *read.table* and *read.csv* can read in data stored as text files, delimited by *almost anything*
- Data from other stat packages can be read using *foreign package?*
  *read.xlsx(file, sheetIndex=1) #excel files*
  *read.dta(file)# stata files*

# .RDA Data

- R Data type
- Can be created from other data sets -data <- load("profit.rda")
  -Saving a data frame as an rda
- Save(data.frame, "dataset.rda")

# Reading Dataset

There are a few principal functions reading data into R.

- `read.table`, `read.csv`, for reading tabular data
- `readLines`, for reading lines of a text file
- `source`, for reading in R code files (inverse of `dump`)
- `dget`, for reading in R code files (inverse of `dput`)
- `load`, for reading in saved workspaces
- `unserialize`, for reading single R objects in binary form

*Source: Computing for Data Analysis-Roger Peng*