Introduction to R

Ken Mwai

Overview and History of R

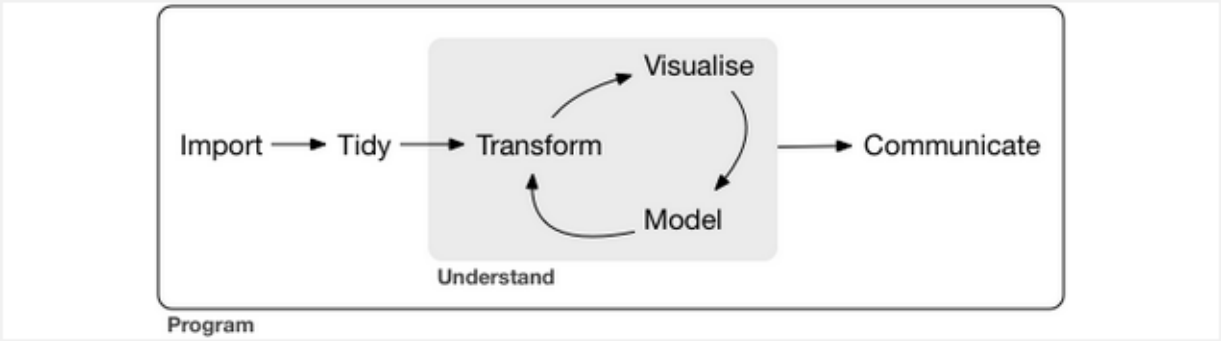
- R is a dialect of the S language.
- S is a language that was developed by John Chambers and others at Bell Labs. S was initiated in 1976
- R was created in 1991 – by Rose Ihaka and Robert Gentleman
- In 1993 R was released to the public. 1997: R core group was formed 2000: R 1.0.0 was released
- We are using R version 4.* (202*)

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
  - R-devel mailing lists
  - 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.)



Data Science and R

Setup local 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

Sometimes it is tricky …

- R can be tricky to learn,
- feel free to contact/tweet/IG/DM any of the demonstrators with questions
- *please make sure that you have thought through your question in advance*
- *R problems can be solved with judicious use of Google and StackOverFlow*

Help Areas

- R Help Mailing List - https://stat.ethz.ch/mailman/listinfo/r-help
- R CookBook - http://www.cookbook-r.com/
- R-Bloggers - http://www.r-bloggers.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
- https://exeter-data-analytics.github.io/IntroToR/

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 `<-` operator ie `x <- 3`
- **Function** A set of instructions carried out on one or more objects.
  - function *mean()* is used to calculate the arithmetic mean.
- **Vector** A collection of one or more objects of the same type . We use `c()`
- **Operator** Is a symbol that has a pre-defined meaning. +*-/
- **Parameter** The kind of information that can be passed to a function – mean(age)

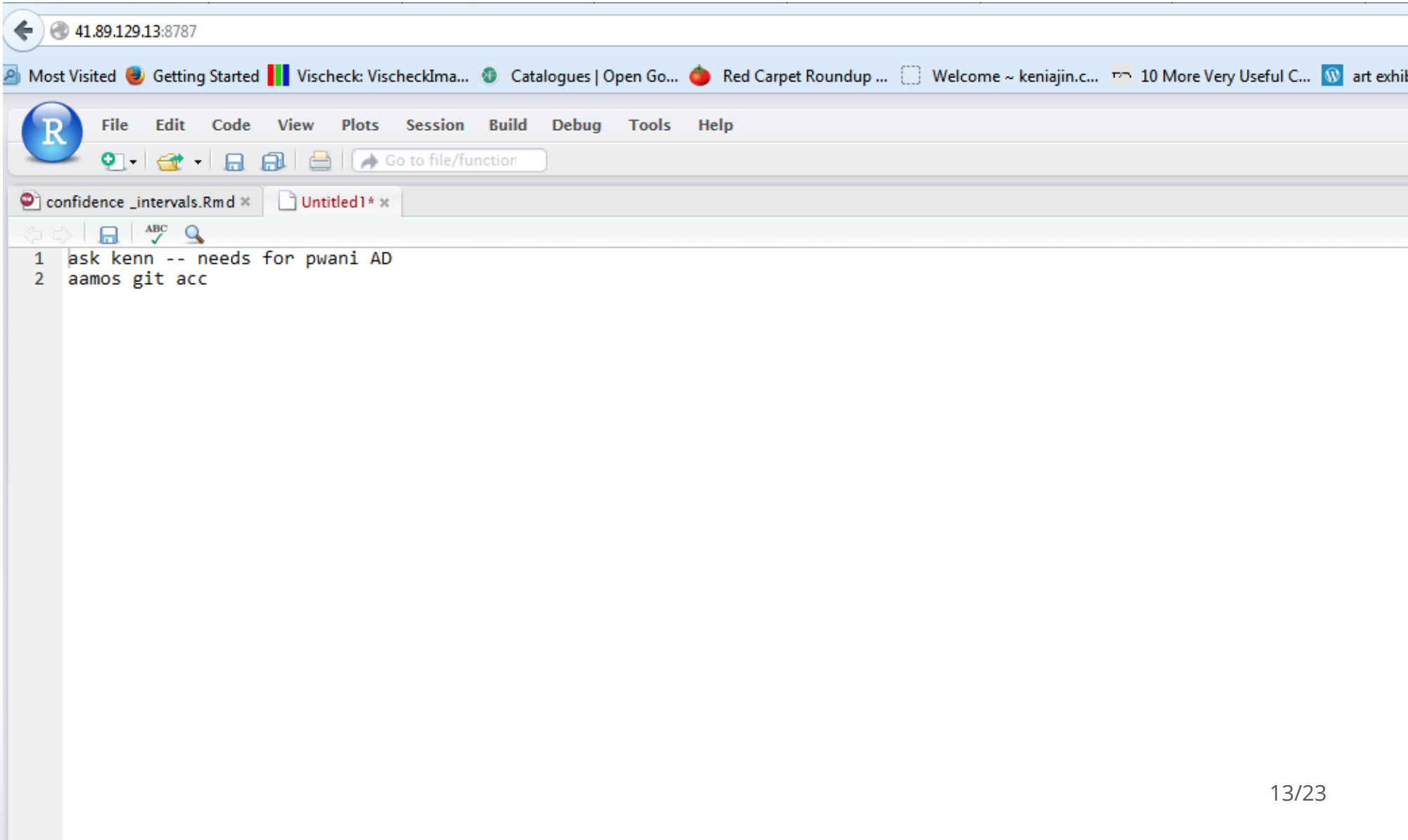
Packages

- A set of functions designed to perform more specific statistical or graphical tasks examples and documentation.
- 17000+ packages found on the CRAN
- To use packages in R, download using `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

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

Factors

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

```
# A factor variable
  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.

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()* – used to load `data.frames`

Create Data Frames

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

```r
# view the contents of a data frame
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
# check the structure of the data frame
str(df)
```

```
## 'data.frame':    9 obs. of  2 variables:
##  $ x: num  1 2 3 4 5 6 7 8 9
##  $ y: chr  "a" "b" "c" "d" ...
```

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 statistics tools can be read using
  - `readxl` - for excel datasets
  - `haven` - for Stata files
  - `foreign` - for other files like SPSS

Task

Install the `readxl`, `haven` and `foreign` package

Solution

```
install.packages('readxl')
install.packages('haven')
install.packages('foreign')
```

Creating an analysis project - Ideal Way

- Using R Studio to create a Project - From an existing directory