Introduction to R for Data Management and Analysis

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Session 6

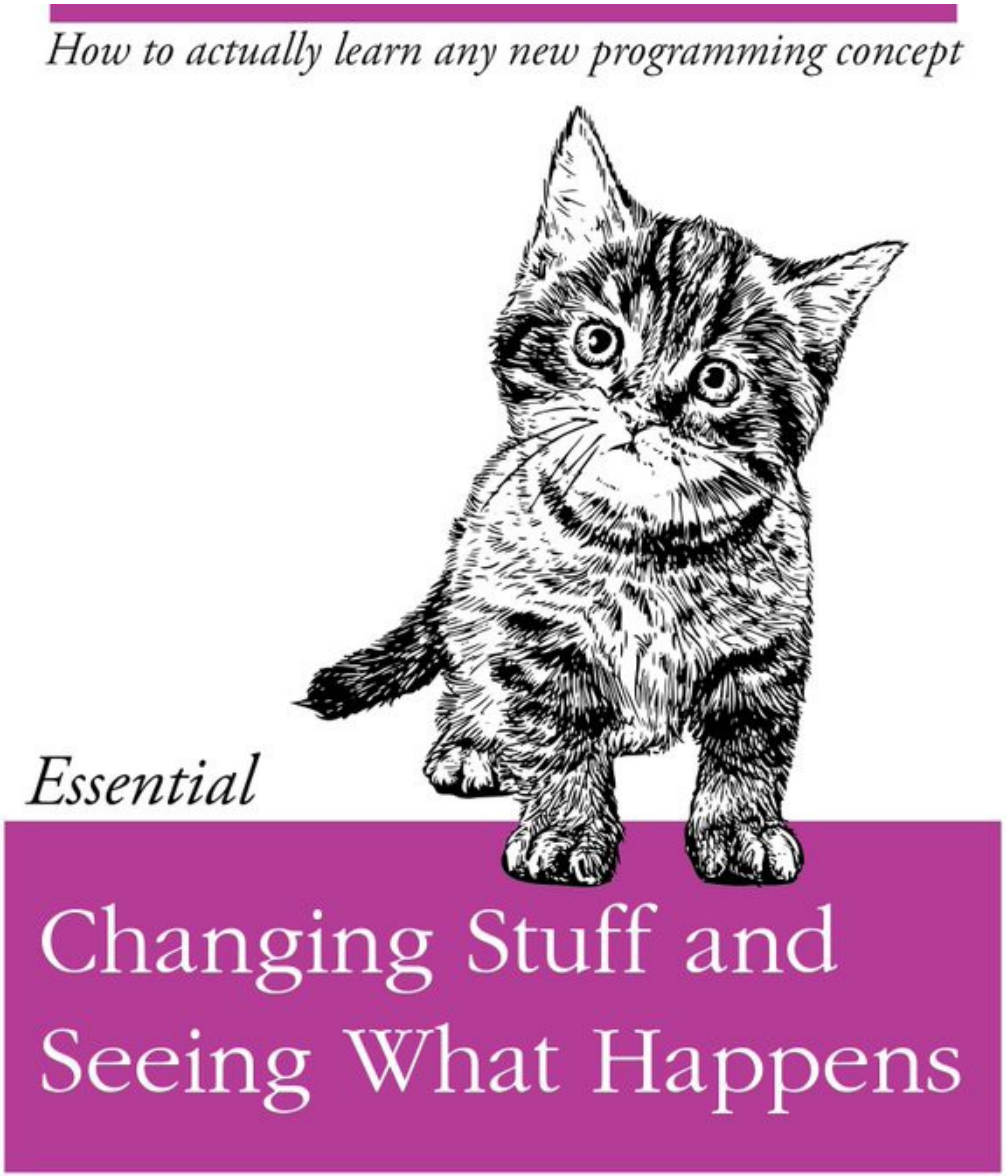
Announcements

- One more week to go
- Next classes
  - Data Analysis workflow
  - Reporting and reproducibility

Topics for today

- Merging datasets
  - Identifying duplicate observations
- Review for loops, plotting systems
- Functions / functionals
- Example where we use functions and loops
- Overview of summary tables and statistical tests

Working in R


How to actually learn any new programming concept
Essential
Changing Stuff and
Seeing What Happens

Merging datasets

- Duplicate observations can be observed with duplicated()
  - Remove these first before merging
- rbind / cbind functions require equal dimensions
  - whether binding by rows or columns
  - row binding requires same column names (colnames)!
- merge function allows binding between unequal dims
  - by argument to tell R what variable to use as the ID
  - no sorting required
- tidyverse: *_join type of functions
  - full_join
  - auto-insertion of NA values

Functions

- Extend the language
  - Portable
- Group operations for ideally one purpose
- Pure functions - input is the same class as the output
- Well defined inputs and output
- Save you from repeating code
- Increase the flexibility of what R can do

Structure of a loop

{Pseudocode}

- for loop structure

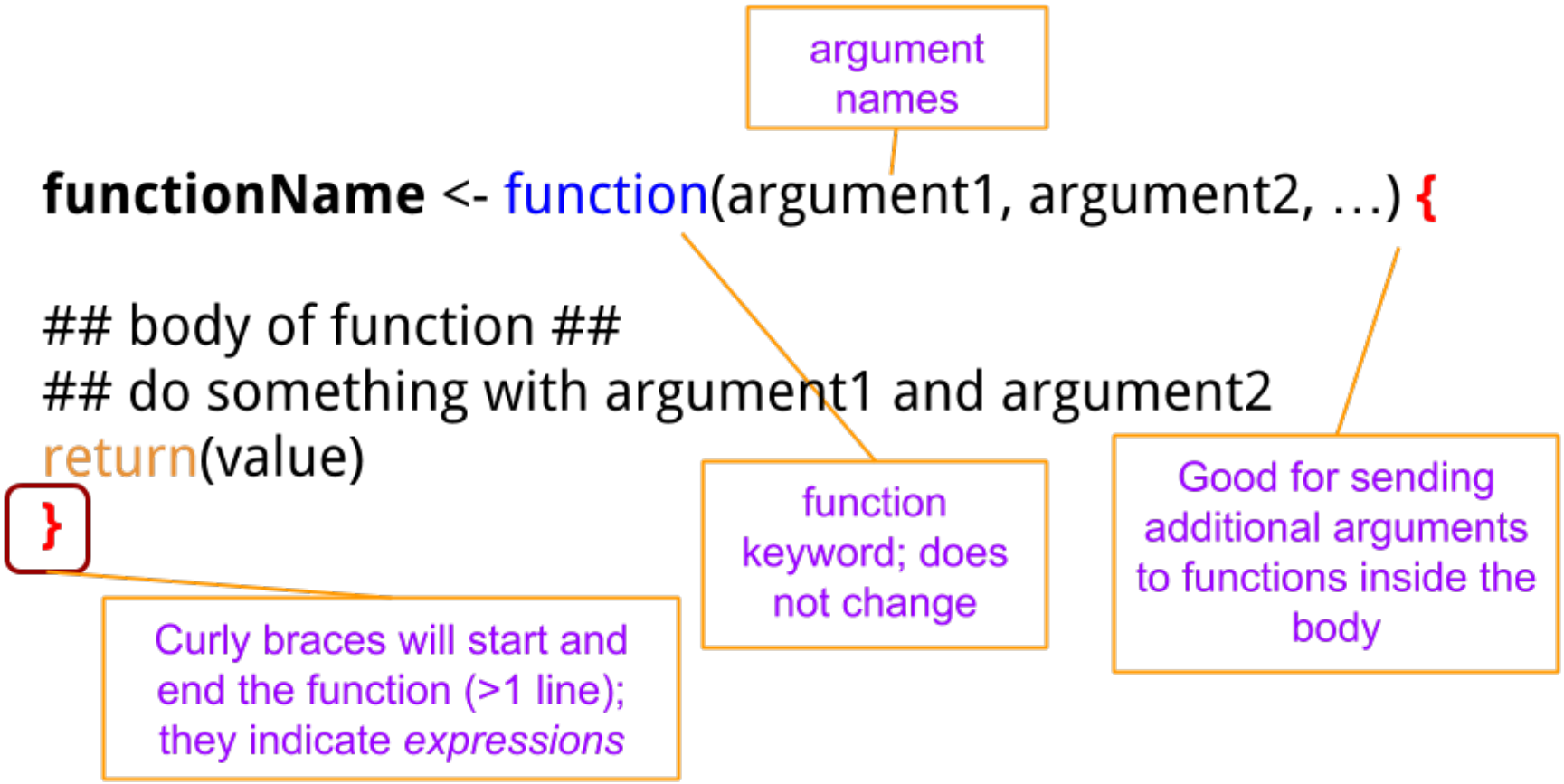
```
for (variable in vector) {
    # do something here with
    variable
}
```

Structure of a function

- function structure

```
functionname <-
    function(argument1 = "default1", argument2 = "default2")
{
    anotherfunction(argument1, argument2)
}
```

More on functions



function(arglist) expr
return(value)

- The body of the function will include the operations to

Notes on Tuesday's lecture (cont..)

- Functions are powerful tools
- Minimize errors
- Create a set of operations to achieve a goal
- Easy to write
  - Predictable input
  - Predictable output
- Loops are useful but are not easily extensible

Functionals

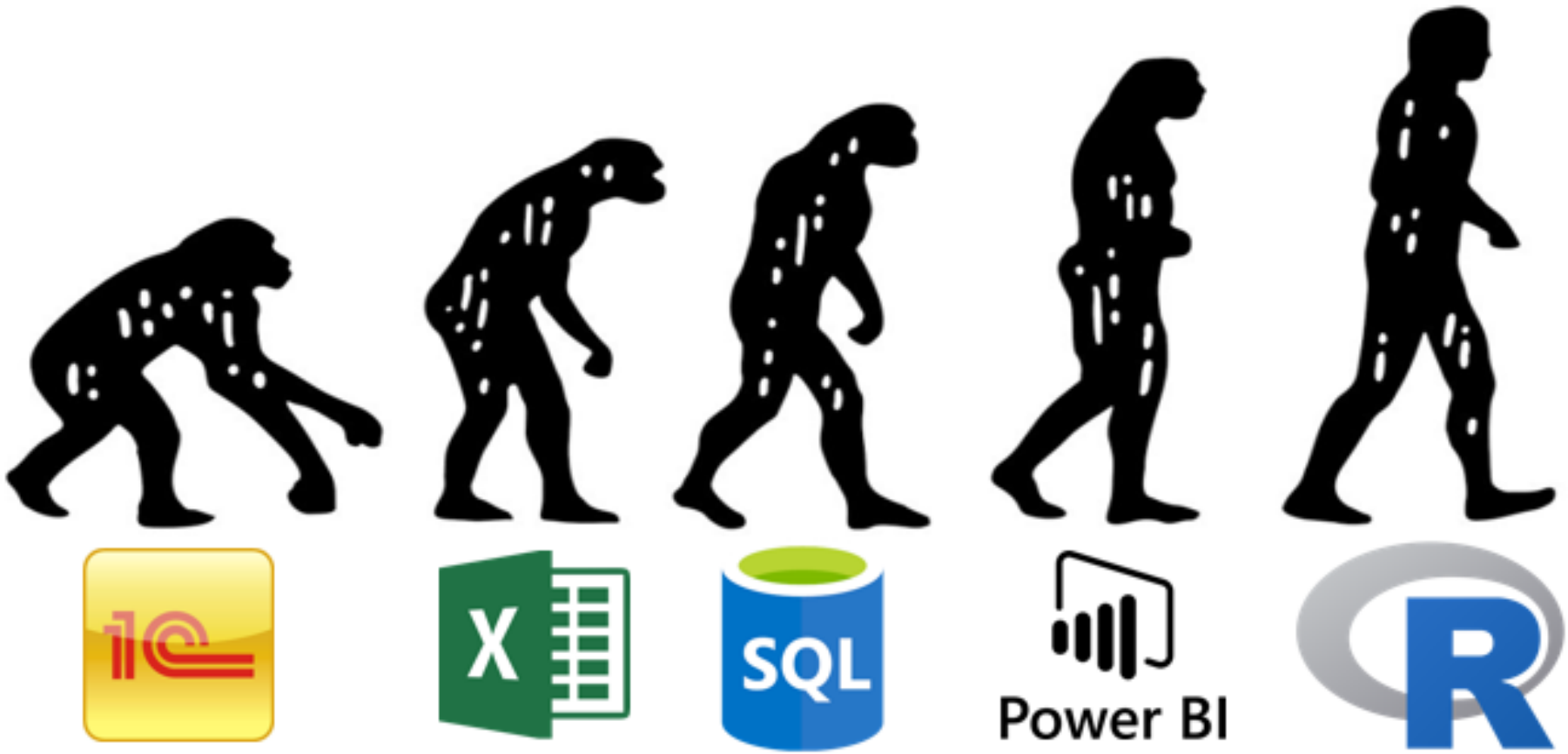
- Functional - an argument to a function that it itself is a function
- Many functions can accept other functions as an arguments
  - aggregate, tapply, lapply, sapply, apply, etc.
- Make coding more efficient and customizeable
- Increased flexibility but add a layer of complexity
- Why use them?
  - To simplify code and avoid repetition

Air Pollutants Example

- R Programming on Coursera
- Write a function
- Read multiple files at once
- Compute a summary statistic

Why don't we use Excel?

Ranking Statistical Software



Mini Review Session

- Zero-level R Tutorial

Common Errors and Troubleshooting

- R Basics Chapter

Data Analysis

- R is particularly good at statistics
- Packages with new methods get published faster
- Extensibility is an MAJOR advantage compared to other software

Descriptives

- Frequency tables
  - table function
    - prop.table
- gmodels package
  - CrossTable function
- mean and sd functions

Statistical Tests

- chisq.test function
  - categorical 2x2
- fisher.test function
  - categorical with correction for small cells
- t.test function
  - categorical (2 levels) & continuous

Useful functions to apply on model objects

- Functions that work on lm class objects
  - summary
  - fitted
  - resid
  - predict

Tidy model results with broom

- Use the broom package to clean up results from model functions
  - tidy - model coefficients
  - augment - fitted/residual values and more
  - glance - model level statistics

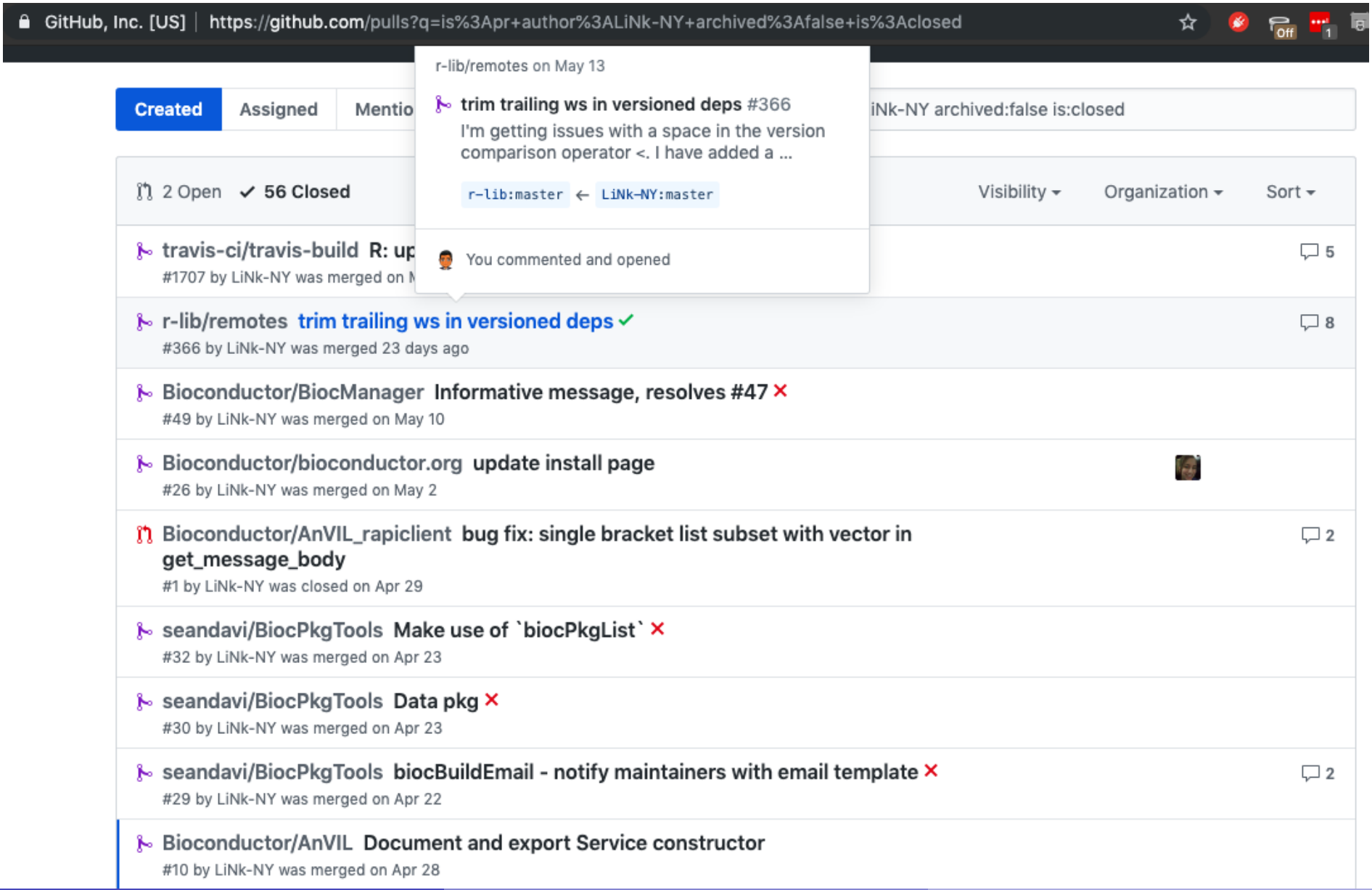
Linear Regression

- lm function
- UCLA walk-through

Logistic Regression and Odds Ratios

- glm function
- Odds Ratio calculation
- UCLA tutorial

Community driven development



GitHub assignment (assigned next week)

- Signup on https://github.com/
- Look for the assignment to be posted under https://github.com/CUNYSPHcode/
- Fork the repository (will contain an .Rmd file)
- Upload your .Rmd file with the answers
- Create a pull request to submit your .Rmd file