Class Summary

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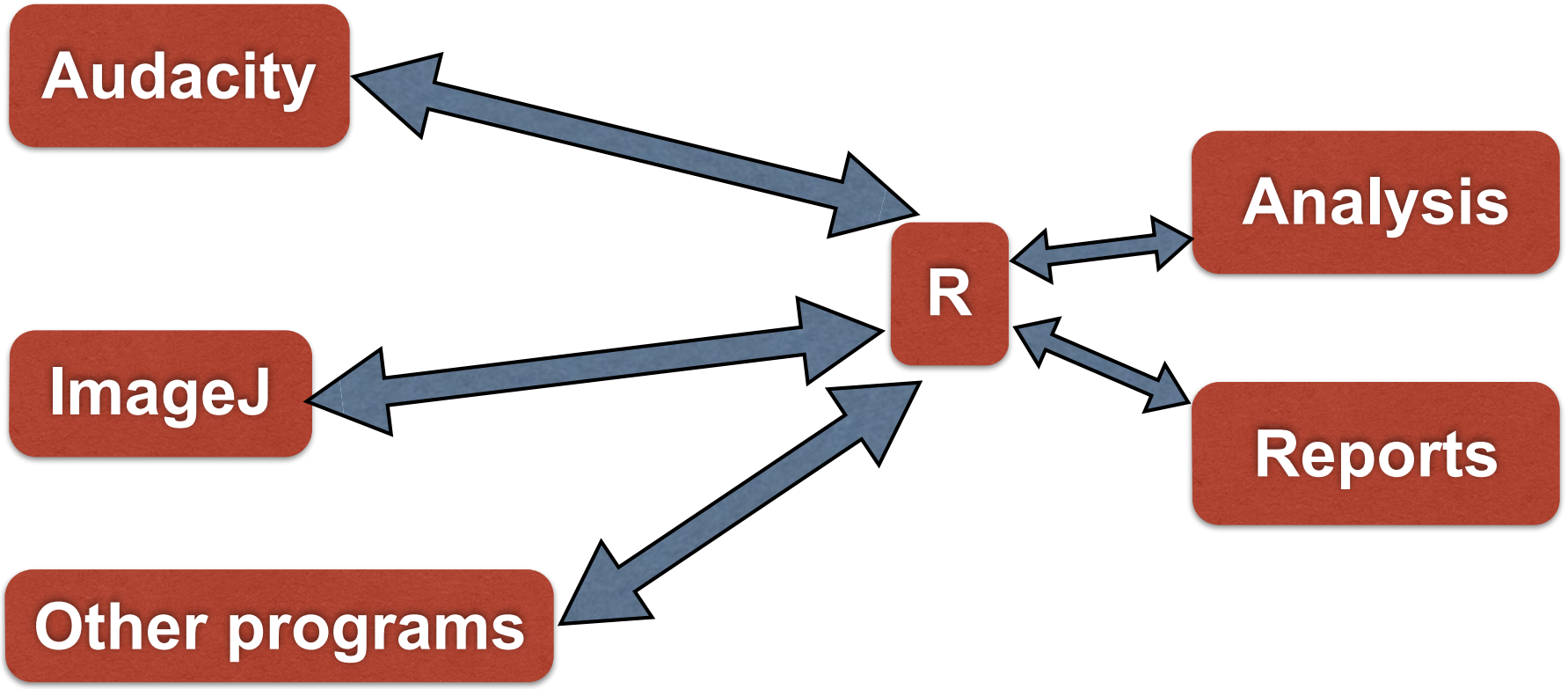
What did we learn?

- Basic R
- Basic use of ImageJ (image processing program)
- Basic use of Audacity (sound processing program)

Psychology

- Understanding human behavior
- Humans have five senses
  - touch, smell, **visual, auditory**, taste
- We performed simple experiments, using "R" related to two of the five senses

Working with R



Alternatives to R

- SPSS, S
- C++, C, Java
- http://alternativeto.net/software/r-project/

Why R?
(or some other language)

- R allows you to create your own tools to accomplish any task,
  - if you cannot find existing tools
- Some languages offer libraries (that contain functions) to perform a wide range of tasks
- (almost) anything can be done
  - thousands of packages

Script

- A script is a file that contains instructions to execute
- Instructions are functions and calls to functions
- Scripts are used to store your programs/ instructions for easy execution (use "source" in R). Other languages have other approaches

Function

- Functions are used to execute a series of instructions on your behalf (rather than typing them every time they are needed)
- Functions have arguments
- Arguments represent anything that can change when you call the function multiple times

Structures in R

- Structures are used to store information
  - **vector**: collection of data (numbers, strings, booleans (T/F) of the same type
  - **list**: collection of objects of any type
  - **data.frame**: a list of colums (represented as vectors) where each column can be a different type, but elements within a column are of the same type.

Other structures

- Matrix: a set of elements represented as a collection of rows and columns, all of the same type. two-dimensional structure
- Array: same as matrix, but higher dimensional than two.
  - used to store color information for images

Most useful functions

- For help:
  - ?, ??, library(help=package_name)
  - google
- Understanding data
  - class, str, summary, names, nrow, ncol

More functions

- Control functions
  - if/else
- Loop functions
  - for, while
- Conversion functions
  - as.vector, as.characters, as.many.others

Data Structures

- Vectors: c(…)
- list()
- data.frame()
- matrix(), array()

Images

- Matrices of pixels (row/colum)
- Each pixel has colors (R,G,B), sometimes A (opacity)
- Images are stored in compressed formats lossy (jpeg) or non-lossy (png), or uncompressed (tif)
- Use the jpeg or png libraries to work with images within R

Sound

- Sound is a pressure wave in the air
- Sound is sampled (44,000 or less samples per second)
- Sound is characterized by pitch (frequency) and amplitude (volume)
- Sounds have channels (stereo, 5.1 surround)
- Sounds can be loaded and saved into programs like Audacity, and manipulated
- Use sound or tuneR libraries in R to manipulate sound further