Intro to CASA Coding Group

25/02/2020

Outline for today

1. Purpose of group
2. Our tools: Languages/software we will learn
3. Examples of coding applications for speech
4. Download R, RStudio, Praat
5. Intro to RStudio
6. Topics for the term

Purpose of this group

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Computer Coding: Writing something in a language a computer can understand in order to tell the computer to do a specific thing or set of things.

Why bother telling a computer what to do when we can just do it ourselves?

Purpose of this group

Why bother telling a computer what to do when we can just do it ourselves?

- Automate repetitive tasks like…
    - opening/closing/saving files
- Minimize human error in data preparation
    - Renaming things in a spreadsheet
- Keep a careful log of how we did our analyses
    - Code = instructions
- “Reproducible research”
- Fun! (seriously)

Purpose of this group

- Develop skills that make it easier to do our job as speech researchers well
- Create a community that comes together to make it easier to learn this stuff

Our tools: Logistics

Project Website

- Website: https://casa-lab.com/coding-group/
- Slack channel: casa-lab-ub.slack.com
  - Invite to join Slack channel (I will send this out via email)

Our tools: Languages & Software

First: Some terminology

Coding: Writing in a language a computer can understand

Scripting: A type of coding that tells a specific program exactly what actions to take

- Scripting & coding are sometimes used interchangeably

Programming: Writing code that serves to actually create another program (an app, software, etc)

Scripts: Text files containing code.

First: Some terminology

Functions: A certain named format of code that outlines a procedure. Often this allows several lines of code to be executed with a single line of code (by using the name of the function)

- For example, in Excel, you may use functions like `=sum(2,2)`. `sum()` is the function that takes input (in this case, numbers), and performs an a specific action (adds them).

Calling: Invoke a function by using the name of the function and specifying parameters.

Our tools

1. R and R Studio
2. Praat

- “R is a free software environment for statistical computing and graphics.”
- Download here

RStudio®

- RStudio is a handy interface that helps you use R.
- Download Desktop version

Praat

- “Doing phonetics by computer”: Praat is a powerful software program that also has its own specialized language for writing scripts
- Praat = “Speech” in Dutch
- Looks like it hasn’t been updated since 1995 but it has and it’s great
- “World’s worst programming language”
    - *don’t let the haters get you down*
- Download here

Examples of coding applications for speech research

1. Data preparation in R

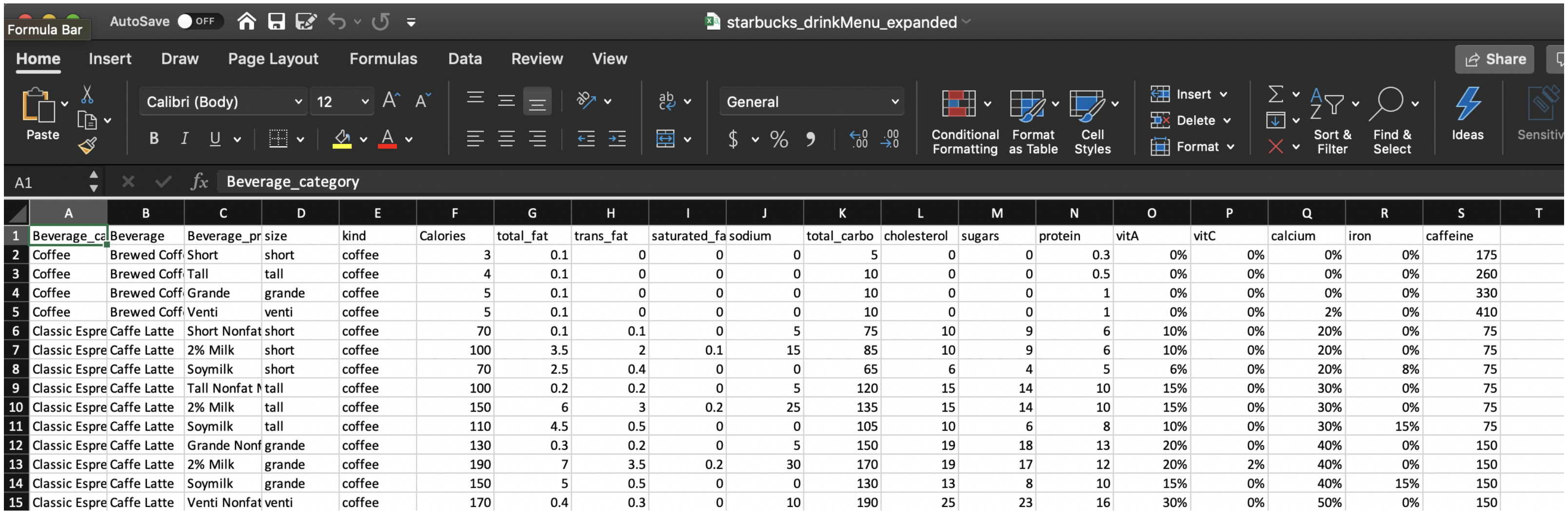
Example: Starbucks data

1. Start with a data set you have in Excel
2. “Read” it into R
3. Do things to it like…

- Instantly calculate means values

Let’s look together

1. Data preparation: Raw data



A1 fx Beverage_category

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Beverage_ca	Beverage	Beverage_pr	size	kind	Calories	total_fat	trans_fat	saturated_fa	sodium	total_carbo	cholesterol	sugars	protein	vitA	vitC	calcium	iron	caffeine	
2	Coffee	Brewed Coff	Short	short	coffee	3	0.1	0	0	0	5	0	0	0.3	0%	0%	0%	0%	175	
3	Coffee	Brewed Coff	Tall	tall	coffee	4	0.1	0	0	0	10	0	0	0.5	0%	0%	0%	0%	260	
4	Coffee	Brewed Coff	Grande	grande	coffee	5	0.1	0	0	0	10	0	0	1	0%	0%	0%	0%	330	
5	Coffee	Brewed Coff	Venti	venti	coffee	5	0.1	0	0	0	10	0	0	1	0%	0%	2%	0%	410	
6	Classic Espre	Caffe Latte	Short Nonfat	short	coffee	70	0.1	0.1	0	5	75	10	9	6	10%	0%	20%	0%	75	
7	Classic Espre	Caffe Latte	2% Milk	short	coffee	100	3.5	2	0.1	15	85	10	9	6	10%	0%	20%	0%	75	
8	Classic Espre	Caffe Latte	Soymilk	short	coffee	70	2.5	0.4	0	0	65	6	4	5	6%	0%	20%	8%	75	
9	Classic Espre	Caffe Latte	Tall Nonfat M	tall	coffee	100	0.2	0.2	0	5	120	15	14	10	15%	0%	30%	0%	75	
10	Classic Espre	Caffe Latte	2% Milk	tall	coffee	150	6	3	0.2	25	135	15	14	10	15%	0%	30%	0%	75	
11	Classic Espre	Caffe Latte	Soymilk	tall	coffee	110	4.5	0.5	0	0	105	10	6	8	10%	0%	30%	15%	75	
12	Classic Espre	Caffe Latte	Grande Nonf	grande	coffee	130	0.3	0.2	0	5	150	19	18	13	20%	0%	40%	0%	150	
13	Classic Espre	Caffe Latte	2% Milk	grande	coffee	190	7	3.5	0.2	30	170	19	17	12	20%	2%	40%	0%	150	
14	Classic Espre	Caffe Latte	Soymilk	grande	coffee	150	5	0.5	0	0	130	13	8	10	15%	0%	40%	15%	150	
15	Classic Espre	Caffe Latte	Venti Nonfat	venti	coffee	170	0.4	0.3	0	10	190	25	23	16	30%	0%	50%	0%	150	

1. Data preparation: Data prep script

`1_prep_data.R`

```
###################################################
# Helper script for analyzing Starbucks drink data
###################################################

# Setup ----

# Load packages that contain functions we will use
library(tidyverse)
library(plyr)

# Load data ----
starbucks <- read.csv("1_materials/starbucks_drinkMenu_expanded.csv")
```

1. Data preparation: Data prep script (Continued)

`1_prep_data.R`

```
# Create new columns ----
# Create a "caffeine" column that is numeric
starbucks <- starbucks %>%
        mutate(caffeine = revalue(caffeine,replace = c(
                                  "varies" = NA, "Varies" = NA)),
               caffeine_num = as.numeric(as.character(caffeine)))

# Is caffeine content over 100 mg? If so, label it "YES", otherwise, "NO"
starbucks <- starbucks %>%
        mutate(too_much_caffeine = ifelse(caffeine_num > 100, "YES", "NO"))

starbucks %>% select(caffeine_num, too_much_caffeine) %>% head()
```

2. Data visualization in R

`2_figures.R`

3. Writing in R

Using `R Markdown` to write:

- Notes & reports
- Papers, articles, theses
- Presentations (like this one!)
- Websites, blog posts!

`R Markdown` allows you to incorporate *code* AND regular text using simple “markdown” syntax (more on that later).

4. Automating repetitive tasks in

For example…

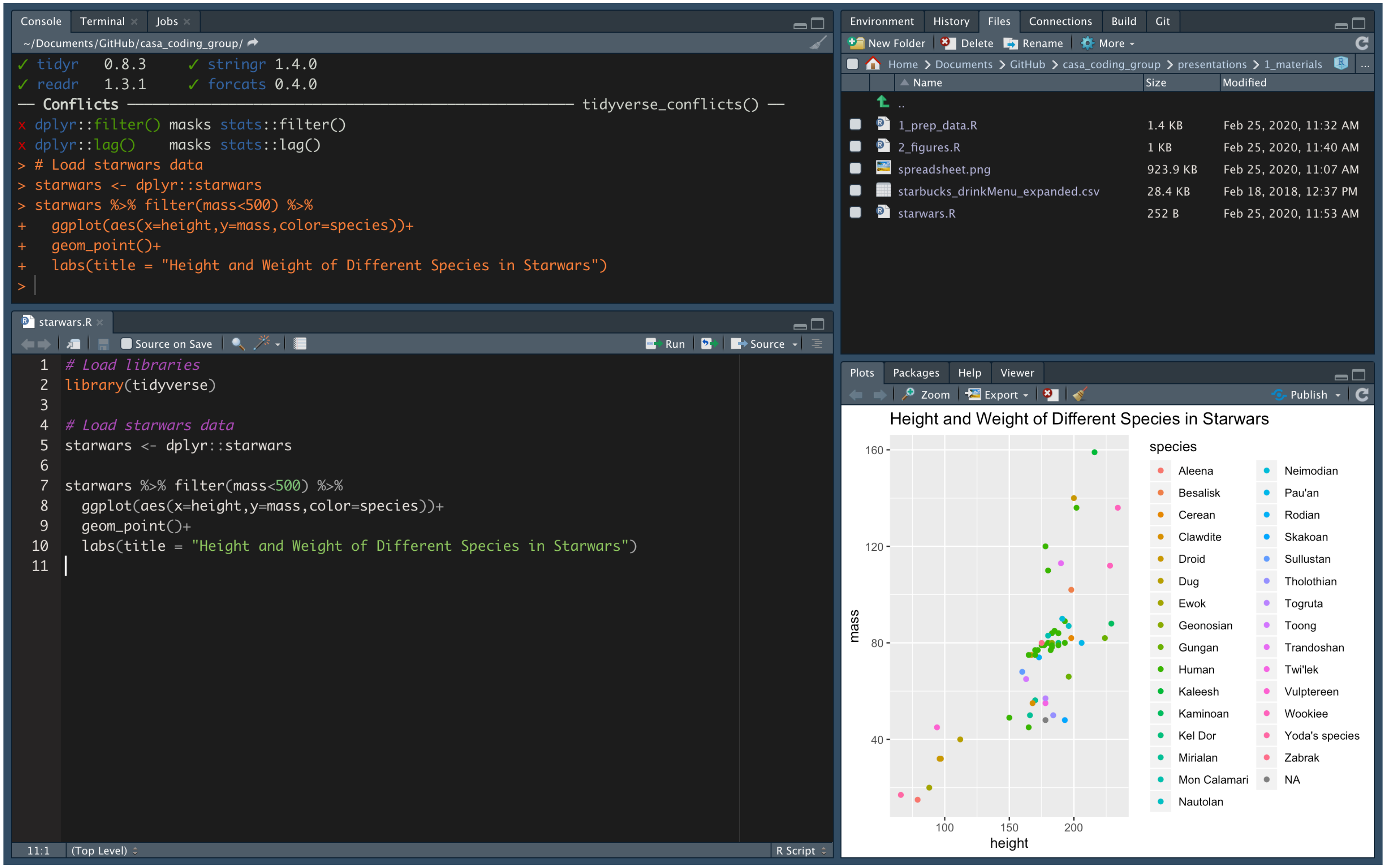
- Automatically create TextGrids for all .wav files in a directory
- Automatically adjust Praat TextGrid boundaries for all files in a directory

5. Running experiments in

Intelligibility experiment in Praat

Intro to RStudio

RStudio layout



```
✓ tidyr   0.8.3     ✓ stringr 1.4.0
✓ readr   1.3.1     ✓ forcats 0.4.0
── Conflicts ──────────────────────────────────────────── tidyverse_conflicts() ──
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
> # Load starwars data
> starwars <- dplyr::starwars
> starwars %>% filter(mass<500) %>%
+   ggplot(aes(x=height,y=mass,color=species))+
+   geom_point()+
+   labs(title = "Height and Weight of Different Species in Starwars")
>
```

```r
# Load libraries
library(tidyverse)

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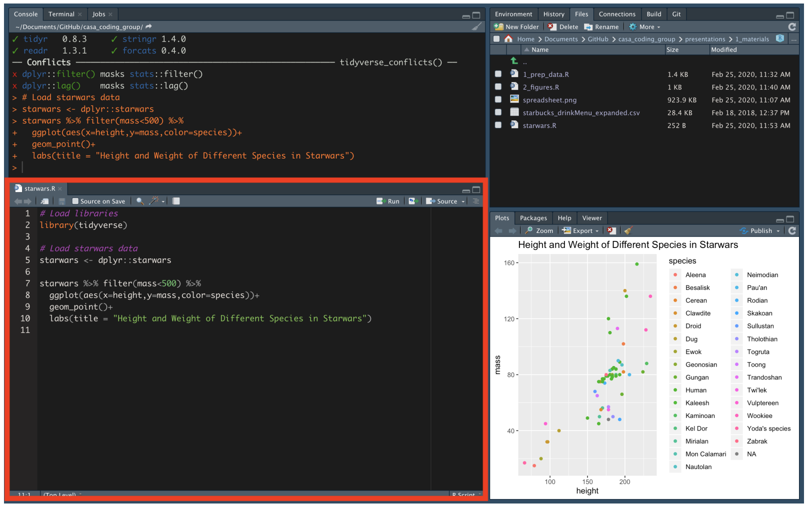
```

Name	Size	Modified
..		
1_prep_data.R	1.4 KB	Feb 25, 2020, 11:32 AM
2_figures.R	1 KB	Feb 25, 2020, 11:40 AM
spreadsheet.png	923.9 KB	Feb 25, 2020, 11:07 AM
starbucks_drinkMenu_expanded.csv	28.4 KB	Feb 18, 2018, 12:37 PM
starwars.R	252 B	Feb 25, 2020, 11:53 AM

RStudio layout: Source pane



```
~/Documents/GitHub/casa_coding_group/
✓ tidyr   0.8.3     ✓ stringr 1.4.0
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starwars.R

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```

Home > Documents > GitHub > casa_coding_group > presentations > 1_materials

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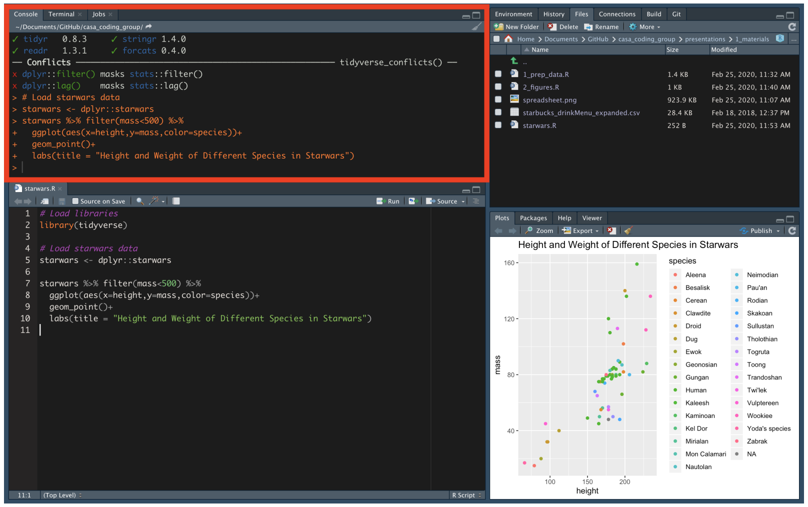
This is where you’ll edit and run your scripts.

RStudio layout: Console pane



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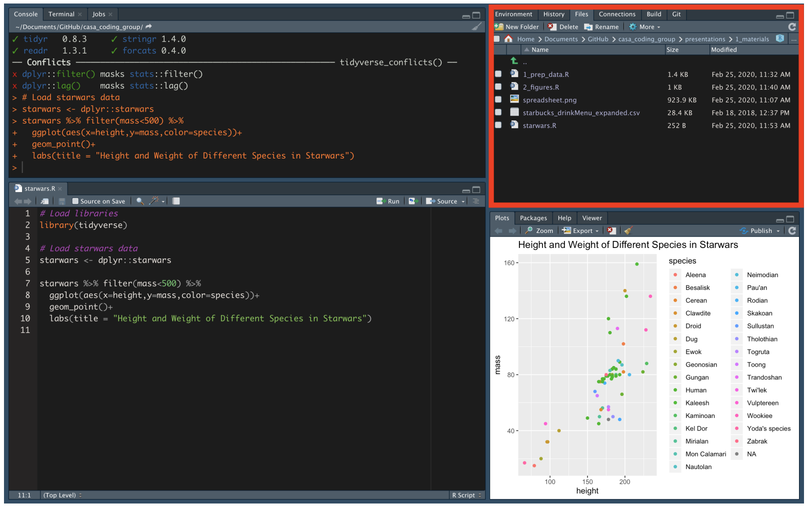
This is where code, error messages, warnings, etc. show up when you run code

RStudio layout: Files/Environment pane



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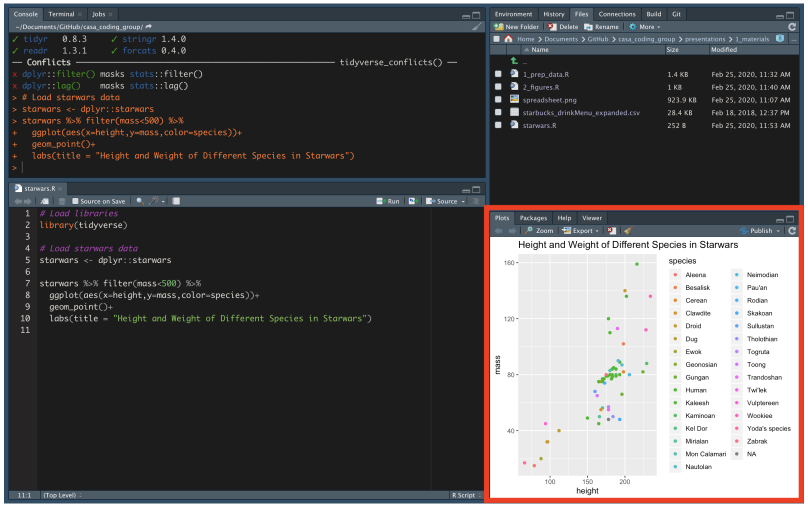
```

Here you can see…

1. Files in your directory (“Files”)
2. `Variables` in your `environment` ("Environment)

- This is anything you have created in R.
- Saving your work to a script allows you to recreate these variables again later.

RStudio layout: Plots/Packages/Help/Viewer pane



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- This is where plots you create will show up when you call them (automatically in “Plots”)
- You can also…
    - search help documentation (“Help”)
    - search for packages (“Packages”)

Complete beginner?

Try this:

1. Sign up for an account on udemy.com
2. Sign up for the “R basics: R programming language” course on udemy
3. Watch videos 1, 2, 3, and 9.

- 1 - R basics (3 min)
- 2 - A walkthrough of downloading R & Rstudio (5 min)
- 3 - the Rstudio interface (19 min)
- 9 - Three common mistakes in R beginners (11 min)

Topics for next time

Schedule for the rest of the term

Date	Time	Location	Topic
2/25	4pm	Cary Hall 42	Intro to group + RStudio
3/10	4pm	TBD	TBD
3/24	4pm	TBD	TBD
4/7	4pm	TBD	TBD
4/21	4pm	TBD	TBD
5/5	4pm	TBD	TBD