R FOR ECOLOGY

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WHO AM I?

- Grad student and quant ecologist

- I work with dispersal – simulations

- RLadies coorganizer
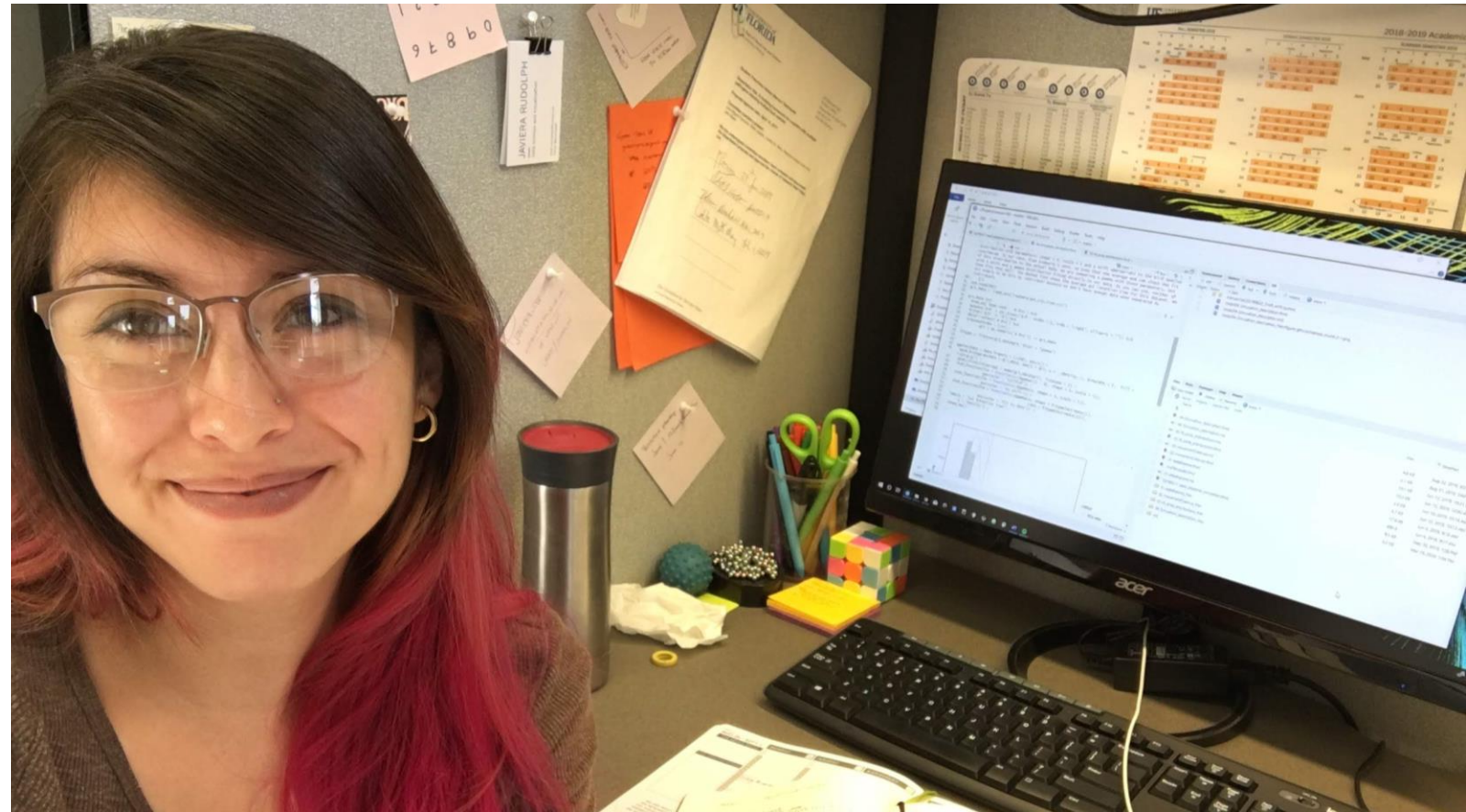
RESOURCE LINK: HTTPS://WWW.R-PROJECT.ORG/ABOUT.HTML

WHAT IS R?

Stack Overflow Traffic to Programming Languages

Based on visits to Stack Overflow questions from World Bank high-income countries. The more-visited languages of Python, JavaScript, Java, C#, and PHP were omitted.

WHY LEARN R?

- Growth
  https://stackoverflow.blog/2017/10/10/impressive-growth-r/
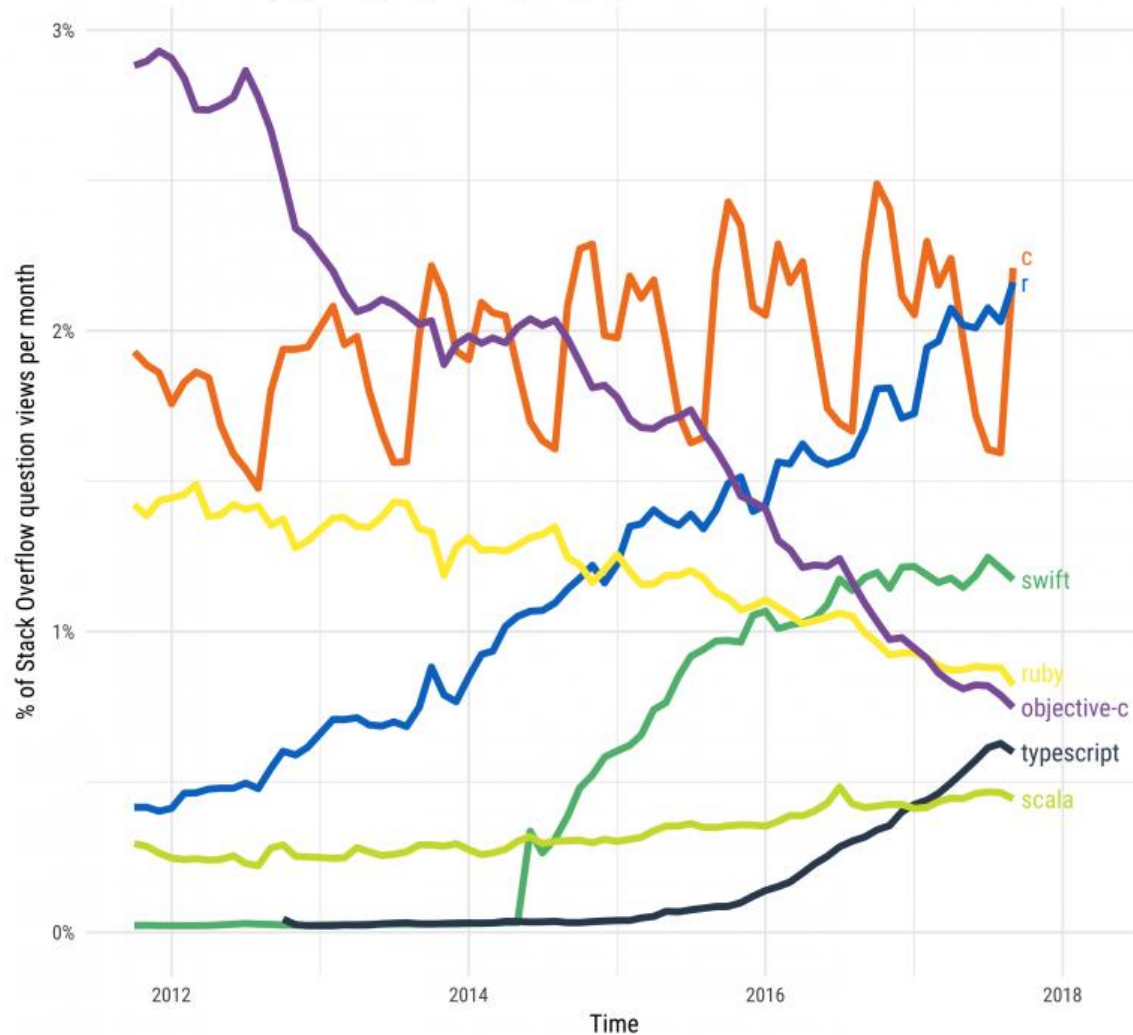
- Reproducibility

- Keeping up with the field

- Communicate with others

WHAT IS R STUDIO?

RStudio IDE :: CHEAT SHEET

Documents and Apps

Open Shiny, R Markdown, knitr, Sweave, LaTeX, .Rd files and more in Source Pane

- Check spelling
- Render output
- Choose output format
- Choose output location
- Insert code chunk

```
1
2
3    Jump to    Jump     Run      Publish    Show file
4    previous   to next  selected to server  outline
5    chunk      chunk    lines
6
7
8    Access markdown guide at
9    Help > Markdown Quick Reference
10
11
12   Jump to    Set knitr  Run this and   Run this
13   chunk      chunk      all previous   code chunk
14              options    code chunks
15
16
17   ```{r pressure, echo=FALSE}
18   plot(pressure)
19
20
15:1     (Top Level)                    R Markdown
```

RStudio recognizes that files named **app.R**, **server.R, ui.R**, and **global.R** belong to a shiny app

```
1
2    Run    Choose        Publish to        Manage
3    app    location to   shinyapps.io      publish
4           view app      or server         accounts
5
1:1    (Top Level)                          R Script
```

Write Code

- Navigate tabs
- Open in new window
- Save
- Find and replace
- Compile as notebook
- Run selected code

```
1    # Good Start...
2    Cursors of        Re-run          Source with or   Show file
3    shared users      previous code   without Echo     outline
4
5
6    "P0030001"
7    "P0030002"
8    "P0030003"        Code diagnostics that appear in the margin.
9    "P0030004"        Hover over diagnostic symbols for details.
10
11
12   get_digit <-function() {
13     ("num" %% (10 ^ n))
14     %/% (10 ^ (n - 1))
15   }}
16
17   fo
18      for        {snippet}
19      foo        {.GlobalEnv}
20      force      {base}
21
22
1:1    (Top Level)                              R Script
```

Multiple cursors/column selection with **Alt + mouse drag**

Syntax highlighting based on your file's extension

Tab completion to finish function names, file paths, arguments, and more.

Multi-language code snippets to quickly use common blocks of code.

Jump to function in file

Change file type

```
Console    Compile PDF    R Markdown
~/IDEcheatsheet/
> foo(1)
[1] 2
> foo <- function(x) x + 1
> foo(2)
foo(2)
foo(2)
> foo(1)
```

Working Directory

Press ↑ to see command history

Maximize, minimize panes

Drag pane boundaries

R Support

- **Import data** with wizard
- History of past commands to run/copy
- Display .RPres slideshows **File > New File > R Presentation**

```
Environment   History   Build   Git   Presentation
Import Dataset          List
Global Environment
```

- Load workspace
- Save workspace
- Delete all saved objects
- Search inside environment

Choose environment to display from list of parent environments

Display objects as list or grid

```
Data
iris            150 obs. of 5 variables
Values
a               1
Functions
foo             function (x)
```

Displays saved objects by type with short description

View in data viewer

View function source code

```
Files   Plots   Packages   Help   Viewer
New Folder   Upload   Delete   Rename   More
Home   IDEcheatsheet
Name
                              Copy...
                              Move...
                              Export...
                              Set As Working Directory
hello.R              19 B     Go To Working Directory       Apr 13, 2016, 11:17 AM
```

- Create folder
- Upload file
- Delete file
- Rename file
- Change directory

Path to displayed directory

A File browser keyed to your working directory. Click on file or directory name to open.

Pro Features

- **Share Project** with Collaborators
- Active shared collaborators

```
garrett    Sessions
IDEcheatsheet           R 3.2.2
New Project...              ✓ R version 3.2.2
Open Project...              R version 3.1.3
Close Project               R version 3.0.3
Share Project...            R version 2.15.3
IDEcheatsheet
RStudio-Essentials
Essentials
shiny-examples
Clear Project List
Project Options...
```

- Start **new R Session** in current project
- Close R Session in project
- **Select R Version**

PROJECT SYSTEM

File > New Project

RStudio saves the call history, workspace, and working directory associated with a project. It reloads each when you re-open a project.

Name of current project

RStudio opens plots in a dedicated Plots pane

```
Files   Plots   Packages   Help   Viewer
Zoom   Export         Publish
```

- Navigate recent plots
- Open in window
- **Export plot**
- Delete plot
- Delete all plots

GUI Package manager lists every installed package

```
Files   Plots   Packages   Help   Viewer
Install   Update   Packrat
scales        Scale Functions for Visualization    0.3.0
shiny         Web Application Framework for R       0.12.2
shinydashboard   Create Dashboards with 'Shiny'     0.5.1
```

- Install Packages
- Update Packages
- Create reproducible package library for your project

Click to load package with **library()**. Unclick to detach package with **detach()**

- Package version installed
- Delete from library

RStudio opens documentation in a dedicated Help pane

```
Files   Plots   Packages   Help   Viewer
R: Arithmetic Operators       Find in Topic
```

Debug Mode

Open with **debug(), browser()**, or a breakpoint. RStudio will open the debugger mode when it encounters a breakpoint while executing code.

- Launch debugger mode from origin of error
- Open traceback to examine the functions that R called before the error occurred

Version Control with Git or SVN

Turn on at **Tools > Project Options > Git/SVN**

- Stage files:
- Show file diff
- Commit staged files
- Push/Pull to remote
- View History

SCALARS, VECTORS, MATRICES AND LISTS

- **Scalars:** a single number

- **Vector:** a row of numbers

- **Matrix:** two-dimensional array of numbers

- **Data frame:** like a matrix but with names at the top of columns

- **Lists:** a collection of vectors, matrices or dataframes

lists
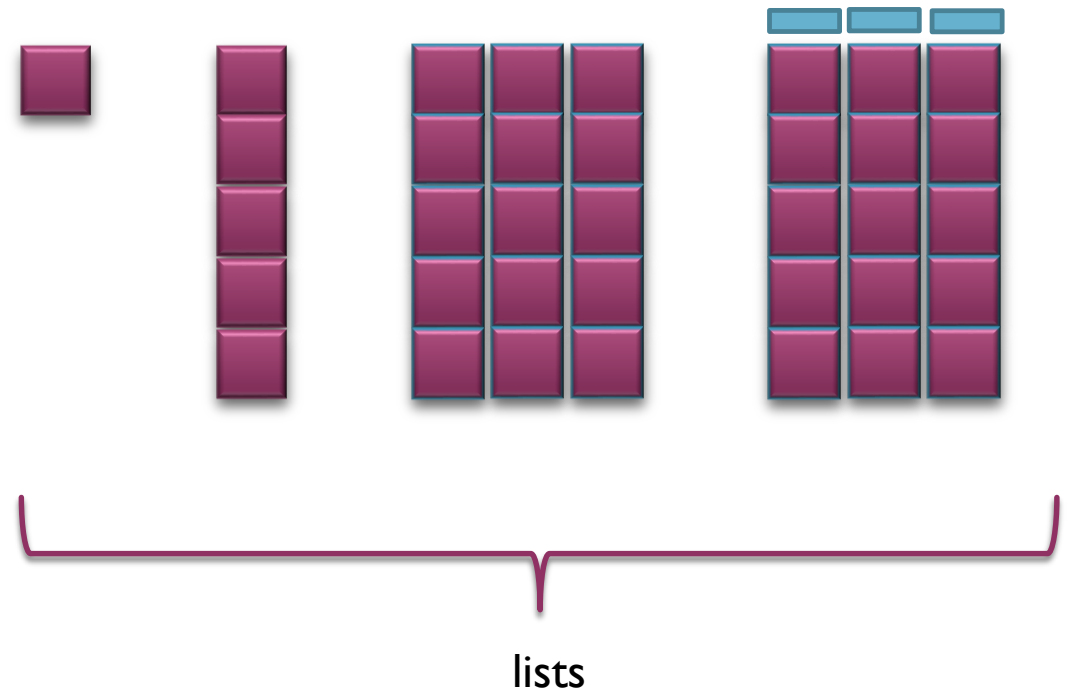
USEFUL CONCEPTS

- What is a script?
  - Any file that has the extension **.R**

- What is a directory?
  - A location in your computer's system of files

- What is the working directory?
  - The folder in your computer where you are currently working and where files will be saved and accessed from.

- How do you set your working directory?
  - Session > Set working directory > choose directory

- What is a library? What is a package?
  - A package is the bundle of functions you can install. You load these packages using the library() function.

RESOURCES:

- https://datacarpentry.org/R-ecology-lesson/index.html

- https://cran.r-project.org/doc/contrib/Torfs+Brauer-Short-R-Intro.pdf

- https://www.rstudio.com/resources/cheatsheets/

- https://resources.rstudio.com/webinars

- https://datacarpentry.org/

- https://stackoverflow.com/questions

- https://www.r-bloggers.com/

- https://training.it.ufl.edu/linkedin/ UF courses to learn R