BIOF 076: Visualization with R

Creating publication quality figures and interactive web apps with the R programming language

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January 10th-14th

Introduction

Creating compelling visualizations is an important aspect of Biomedical research. The R programming language provides many libraries for creating beautiful figures and interactive web apps. As R is an open source project, it facilitates open science and reproducible research. R has been heavily used by bioinformaticians and data scientists for years, and has become increasingly easy to use. This course is designed to allow researchers to quickly dive into R and make visualizations for their own work. No previous experience in R is required.

After this course you will be able to:

- Load and prepare data for plotting
- Generate common scientific plots like Bar graphs, scatter plots, and heat maps using multiple plotting libraries
- Use git, GitHub and binder to share plots
- Use visualizations to explore new data
- Combine multiple plots to create publication quality figures
- Design interactive web apps with R-Shiny
- Integrate plots from R into posters and papers
- Complete a final project with your own data

Format

The workshop is structured as a series of interactive lessons, with a lecture and exercises components. There Our engagement during this workshop will take several forms:

- Class materials: All materials, including lecture slides and excercises will be availble on canvas, and the course Github repository
- All lessons will be held live over Zoom
- Communications: There will be a slack group created for the class.

Software and Materials

We will install all software at the beginning of the course. This will require administrative access on your computer. If you do not have this(ie, you have a government machine), the software you will need is listed below.

- Software
  - R language base system - the core interpreter for the R language that runs the code we will write

- Rstudio - an integrated development environment(IDE) that makes it significantly easier to write code
- git - a version control system for writing code
- GitHub - students will sign up for GitHub, an online repository for code.

Schedule

Day	Time	Topic
Monday	9AM-9:50AM	Course Introduction/Basic Programming in R - Part 1
	10AM-10:50AM	Basic Programming in R - Part 2
	11AM-12PM	Basic Programming in R - Part 3
	12PM-1:00PM	Break
	1PM-1:50PM	Using the ggplot2 library - Basic Plots
	2PM-2:50PM	Using the ggplot2 library - Customizing themes and Aesthetics
	3pm-3:50PM	Office hours
Tuesday	9AM-9:50AM	Review / Conditional programming
	10AM-10:50AM	Manipulating Data with the tidyverse Part 1
	11AM-12PM	Manipulating Data with the tidyverse Part 2
	12PM-1:00PM	Break
	1PM-1:50PM	Manipulating Data with the tidyverse Part 3
	2PM-2:50PM	Using the ggplot2 library - Complex Plots
	3pm-3:50PM	Office hours
Wednesday	9AM-9:50AM	Extensions to ggplot
	10AM-10:50AM	Combining multiple plots to make Figures
	11AM-12PM	Plotting with Maps and making Animated plots
	12PM-1:00PM	Break
	1PM-1:50PM	Intro to R Markdown
	2PM-2:50PM	Making Copycat Plots - Building intuition for making novel plots
	3pm-3:50PM	Office Hours
Thursday	9AM-9:50AM	Review/Interactive plots with Plotly
	10AM-10:50AM	Intro To Shiny
	11AM-12PM	Shiny - UI
	12PM-1:00PM	Break
	1PM-1:50PM	Shiny - server
	2PM-2:50PM	Complex Shiny Apps
	3pm-3:50PM	Office Hours
Friday	9AM-9:50AM	Course Summary
	10AM-10:50AM	Student Project Development
	11AM-12PM	Student Project Development
	12PM-1:00PM	Break
	1PM-1:50PM	Student project presentations
	2PM-2:50PM	Student project presentations
	3pm-3:50PM	Office Hours

A note on the schedule

- We will try to cover all material listed in the schedule. However, it is very possible we will move slower than anticipated, and so any material we do not cover within the first 4 days will be covered on the final day(Friday) in lieu of the presentations

Office Hours

Office hours will be held at the end of each day from 3-4PM.

FAQ

Q. Do I need any Prior Experience in R

A. No, This class requires NO expreience in R. We will cover everything you need to know within the course.

Q. I don't have administrative access to my computer, how will I be able to install the necessary software?

A. While it's best to work on your own machine, a standalone cloud based environment will be available for people to use.