PS 211: Introduction to Experimental Design

Fall 2025 · Section C1

Discussion 1: Introduction to R and RStudio

Outline for Today

- Attendance
- Syllabus: Discussion grade (10%)
- Discussion section goals
- My background
- Introductions
- R and RStudio
- Set up RStudio (your participation credit for today!)

Attendance

- **Lecture (C1):** Tue & Thu · 11:00 a.m. – 12:15 pm
- **Discussions:**
  - C2: Wed 12:20 – 1:10 p.m.
  - C3: Wed 1:25 – 2:15 p.m.

All course meetings in CAS 306

- You are currently in PS211 Discussion Section (Introduction to Experimental Design)
- Please sign the attendance sheet up at the front! Might try to make this more efficient, TBD

Syllabus: Discussion Section = 10% of your grade

- **Discussion Section = 10%**
  - In-depth review of class material and semester-long research project.
  - In small groups, you will come up with a research hypothesis, conduct a literature review, and write hypothetical methods, results, and discussion sections to be presented on a poster at the end of the semester.
  - If you miss a discussion section, contact your TF about make-up work.
  - If you miss three or more discussion sections, you will not get full credit.
  - If you miss five or more discussion sections, you will get a 0 for discussion participation.

Discussion Section Goals

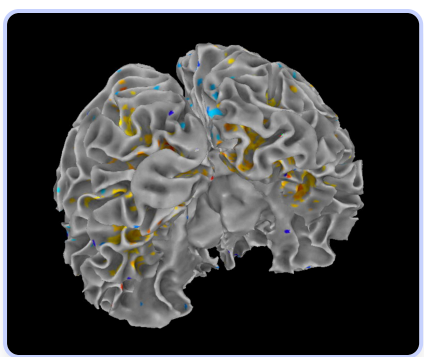
- Do ask questions!
- Do answer questions!
- Participation is a part of your discussion grade, and it also ensures we are all on the same page
  - This does NOT have to be a class where you learn math all by yourself
  - Asking and answering questions can help you and your peers
  - It'll also help me understand which concepts are straightforward vs. trickier!
- Teaching is important to me, and I'd love to create an open, encouraging, and intellectual environment
  - Please feel free to provide feedback if you think anything can be improved

Teaching Fellow: my background

Juneau Wang

PhD Student in Psychological & Brain Sciences

- **Pronouns:** he/him
- **Email:** juneauw@bu.edu
- **Office:** 111 Cummington Mall, Room 242
- **Office Hours:** Tuesdays 12:30 - 2:30 p.m.



- **Boston University Class of 2024**
  - BA/MS Biology
  - Minor in Music Performance 🎤🎷
  - Research in auditory perception and attention
- **PhD Student in Psychology**
  - Research in visual perception and awareness
  - Neuroimaging – visualize brain activity (fMRI)
- Teaching experience is important to me!

Introductions

- Rapid-fire: your name & your favorite season

From Lecture 1... Course Materials

There is *NO TEXTBOOK* for this course

That means it's very important that you come to class, because we will go over all the material you need to know for the exams and assignments.

However, we will use ...

R and R Studio

We will use R and R studio for statistical analyses. Both are free and open-source software, which means you can download and use them without paying anything.

This is **not** a coding class. We do not expect students to have prior programming experience, and we will walk you through everything you need to know. Do not panic!

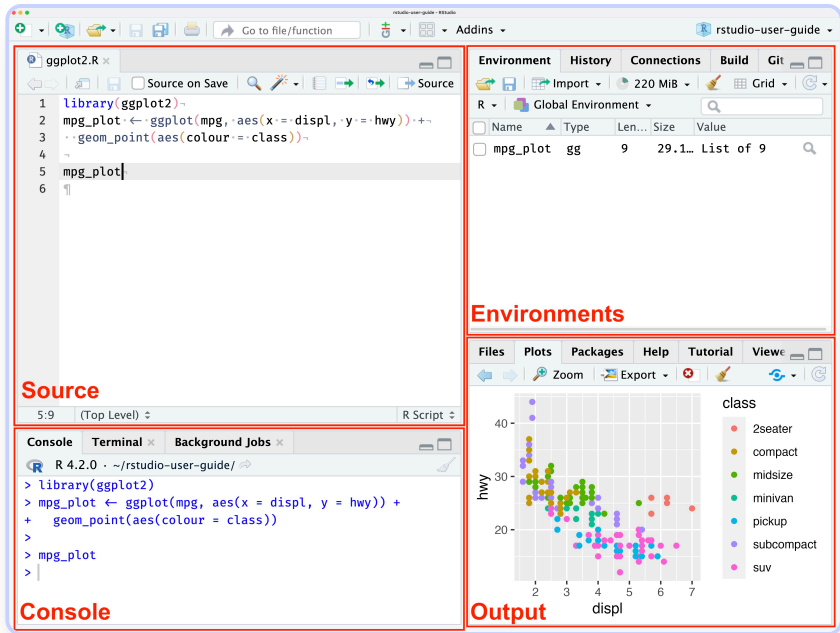
R vs. RStudio

- **R**
  - The programming language
  - Where all the *functions* & calculations happen
- **RStudio**
  - An *IDE* (Integrated Development Environment)
  - Makes R easier to use with menus, tabs, and projects

- Think of **R** as the *engine*
- **RStudio** is the *car dashboard*
- We'll write code in RStudio → it sends commands to R → results appear in the console

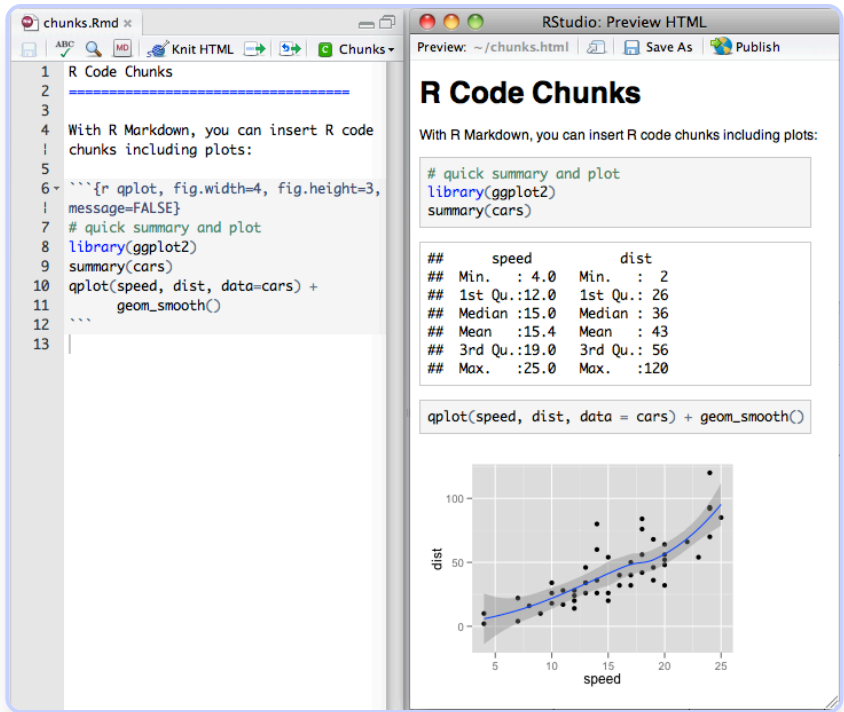
RStudio Interface: 4 Main Panes

- **Source**: Write & save scripts (.R or .Rmd files) that you can run later
- **Console**: Run commands immediately – not part of a script!
- **Environment**: See output variables, datasets, loaded packages from your code
- **Plots/Files/Help**: Plots, file browser, documentation



R Markdown Basics

- **Problem:** Reading, writing, and grading raw R code can get messy
- **Solution:** R Markdown combines your **code**, **results**, and **write-ups** in one clean document
- **Text cells:** For explanations and notes → uses simple Markdown syntax
- **Code chunks:** Place your R code here! Start with three backticks
- **Knit button:** Runs code → outputs a nicely formatted HTML/PDF/Word file



Functions & Packages

- R comes with many built-in functions so that you don't have to do calculations by hand
  - **Functions**: Reusable commands → `function_name(input)`
  - e.g., `mean(c(1, 2, 3))` → calculates average
- However, there are some very useful functions (like plotting data) that can be installed from...
  - **Packages**: Add-on toolkits with extra functions
  - Install once: `install.packages("ggplot2")`
  - Load each session: `library(ggplot2)`
  - These functions are written by different authors to make everyone's lives easier!

Setting Up Your Project

- Create a folder named **PS_211** on Desktop (Mac or PC)
- Open RStudio → *File* → *New Project* → *Existing Directory* → select **PS_211**
- Save scripts/files inside this folder so everything stays organized
- Pro tip: Use short file paths **without any spaces** → easier to work with in R
  - Good: PS_211 ✓
  - Not so good: PS 211 ✗

Participation credit for today

- Work together and help each other! I'm happy to answer any questions!
- Make sure R and RStudio are installed
  - https://rstudio-education.github.io/hopr/starting.html
  - (Link also on Slack → `#general` → Important Links)
- Create your **PS_211** folder on your desktop
- Open RStudio → *File* → *New Project* → *Existing Directory* → select **PS_211**
- Inside that folder, download `grade_calculator.Rmd` from Slack
  - The function already works! Do not edit `calculate_grade`
  - Run each code section as-is
  - Then, go to the bottom section `"Change the numbers below"` and explore what happens when you change the numbers!
- Knit the file to HTML