Computational Methods Syllabus
Computer Camp

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Hello and welcome to Vanderbilt!

1   Learning Goals

By the end of Computer Camp, our goal if for you to be able to:

- Load data in R

- Manipulate the data in basic ways (like tabulating results)

- Find help online when you get stuck in R

- Compile basic LaTeX documents

- Choose good tools for organizing papers and notes during your first year.

- Offer some suggestions for starting studies at Vanderbilt in an organized way

2   Required Programming Background

None.

I have *absolutely no expectations that students will have any experience with programming!* Computer Camp is required for all students, and many students have never worked with statistical software. That's FINE! If you know how to use Google and email, you have plenty of experience – everything else I'll take care of.

At times during the course, I may make statements about how the tools we're learning (like R) compare to different tools (like Stata or Python) if I find there are students with experience in these other tools. However, if I make those comparisons, it is only to help

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*Credit to Nick Eubank and Claire Evans for putting most of this syllabus together.

those students avoid the traps one can fall in if one's background is in another language. It is in no way because I *expect* all students to have experience with other tools.

3   R

I'll spend most of Computer Camp teaching you to use a program for statistical analysis called R (yup, just the letter).

Why R? Because it's currently the most-used statistical software in political science, and using the same tool as those around you will make it easier to collaborate and get help.

R isn't the best tool for everything, however. The reality is that there are lots of tools for statistical programming, and each has its own strengths and weaknesses (e.g. R, Stata, SPSS, Python, Julia, Matlab, etc.). People develop really strong opinions about what language is *best*, and sometimes pass judgement on people who use other languages. I would like to discourage this type of thinking.

As a result, over the course of your career you may find yourself gravitating to one tool or another as required by your research. But in providing you with a firm foundation in a very popular language like R, I feel confident that I'll not only be providing you with tools that will allow you to do most everything you'll want to do in graduate school, but I will also be providing you with *generalizable* skills around data manipulation that you will find useful if you later change platforms.

4   LaTeX

Towards the end of Computer Camp, we'll go over how to use LaTeX- a typesetting tool that makes formatting and writing papers "easier". Once you get the hang of things, using LaTeXreally does offer a ton of advantages over a word processor like Word. There is learning curve, however, that can sometime be frustrating to climb up. Hopefully, our LaTeXsessions will help minimize the slope of that curve, so that you are at least conversant enough to troubleshoot your issues.

There are many platforms for using LaTeX, but in computing camp we'll be using one of the simplest - Overleaf. Before coming to computing camp, you'll need to create an account at Overleaf.com. If you have trouble downloading, we can certainly figure it out.

5   Other Useful Tools

On Friday, bringing our math and computer camp adventure to an end - we will be going over some ways to make your life easier just organization wise. This includes a

discussion of how you can manage references really easily using LaTeX, organizing notes and downloading papers using Zotero, and other tips and tricks.

6   Class Organization

In this class we will be "flipping the classroom" – you will be required to review tutorials on R between classes, and each afternoon we will focus on doing exercises that allow you to get hands on experience with the skills you've read about in an environment where help will be available. These tutorials aren't very long, and I **strongly** recommend that while you read through them you do so with an open R session so you can just play around a little, trying out the things you learn. The research on learning to program is exceedingly clear on this point: **the only way to learn to program is to actually program**, so the more time you spend playing with R, making mistakes, and troubleshooting, the more you will learn. We'll do lots of exercises in class, but the more you play on your own too, the more you will learn.

In particular, I will primarily rely on a set of excellent R tutorials written by Simon Edjmeyr which you can find at:

- https://sejdemyr.github.io/r-tutorials/basics/

as well as a few supplementary tutorials from Kelly Black which you can find at:

- https://www.cyclismo.org/tutorial/R/

7   Schedule

Class 1: Getting Started

Thursday, August 8th

- Discuss course goals
- Do baseline knowledge assessment
- Install R on personal laptops
- What is R? The Vending Machine Analogy
- Intro to R tutorial

Homework to be done before Class 2:

- Edjemyr Tutorial: Intro to R
  We'll go over most of this material on the first day, but please skim it at home for completeness.

- Edjemyr Tutorial: Vectors
- Edjemyr Tutorial: DataFrames

Class 2: Vectors and Dataframes

Friday, August 9th

- Review vectors
- Introduce DataFrames and REAL DATA!

Homework to be done before Class 3:

- Edjemyr Tutorial: Modifying Data
- Edjemyr Tutorial: Collapsing Data

Class 3: Modifying Data and Getting Help

Monday, August 12th

- Modifying Data using dplyr
- Getting help

Homework to be done before Class 4:

- Edjmeyr Tutorial: For Loops
- Create an account on Overleaf.com

Class 4: LaTeX and Loops in R

Tuesday, August 13th

- Intro to LaTeX
- Writing Equations
- The Stargazer Package
- For Loops

Homework to be done before Class 5:

- Download Zotero or Mendeley (I use Zotero but many others here use Mendeley).
- Download either the Zotero Connector or Mendeley Web Importer.

***Wednesday, August 14th*: NO CLASS**

Class 5: Reference Management Systems

Thursday, August 15th

- Reference management with Zotero or Mendeley
- Downloading papers with ease
- .bib files
- Miscellaneous R Topics