CS&SS 569 Visualizing Data and Models
Winter 2026
Section Syllabus

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Section	Office Hours
F 3:30-4:45 pm	Last 30 mins of section, or by appt
Zoom link	Zoom link

Overview. Sections are designed to complement the lectures by focusing on the application of visual principles and techniques presented in lectures. In particular, we focus on their implementation in R. We will first cover the basics of R, RMarkdown and LaTeX that are fundamental to data wrangling, data analysis and scientific presentation. We will then unpack the inner working of two graphic packages, ggplot2 and tile, in order to exert greater command over a myriad of parameters in the graphic design, guided by proper visual principles instead of being dictated by the programming defaults. The rest of the sections will cover selected topics such as visualizing particular types of data (e.g. spatial data and relational data) and interactive visual display. The goal is for students to acquire the advanced skills to solve a wide range of data visualization tasks and to develop a consistent workflow in both programming and scientific communication.

Programming Assistance. Our most preferred communication channel is Slack, which allows you to insert code block in your messages. It has the added benefit of facilitating knowledge spillover through peer discussion and mutual assistance. Please post your questions on Slack related to R programming, graphic packages, or debugging. When you post a question, the best practice is to create a "minimal, reproducible example," instead of taking a screenshot of a code snippet (see here and here). Alternatively, please feel free to come to my office hours for further

consultation, or email me.

Section Resources. Consult the "Labs" section of Chris's website for all slides, codes and data used in sections.

Homework Submission. Please submit your homework in PDF. We recommend using **RMarkdown** to integrate plain text, graphic outputs and code chunks which can then be rendered ("knitted") into a single PDF output. You will have to submit your homework PDF on the Canvas course website (in assignments). You must upload your PDF file in the following format with no whitespaces:

> File name: CSSS569_HW1_RamsesLLobet

Section Schedule

There will be 9 sections in total:

Week	Topic
	Setting the Stage
1	Intermediate R and prediction
2	Intro to LaTeX with Overleaf
	Graphic Tools in R
3	Intro to Base R Graphics and ggplot2
4	Advanced ggplot2 and Extensions
5	Intro to tile
	Selected Topics (Open to Input)
6	Visualizing Spatial Data
7	Visualizing Relational/Network Data
8	Interactive Visual Display with R Shiny
9	T.B.D.

Section Outline

Week 1: Intermediate R and prediction. Provides an overview of the course sections and logistics. Offers a review of intermediate-level R programming: pipe operator |>, data types and structures, data import, and data wrangling using both Base R and the tidyverse environment. Additional topics include exporting R output to subdirectories and using R Markdown to "knit" compact, shareable, and reproducible reports. We will also cover prediction and simulation of quantities of interest for non-linear models.

Week 2: Intro to LaTeX with Overleaf. Introduces TeX engines and various text editors. Introduces basic LaTeX commands, environments and packages, especially for page set-up, inserting figures, and typesetting tables and formulas. Showcases useful templates and extensions, such as TikZ, beamer, and BibTeX.

Week 3: Intro to Base R Graphics and ggplot2. Introduces Base R graphics. Introduces basic ggplot2, with attention to various consequences of the interaction of `data = ...`, `mapping = aes(...)`, `geom_{...}`, and `inherit.aes = TRUE`. Implements small multiple with `facet_grid()` and `facet_wrap()`.

Week 4: Advanced ggplot2 and Extensions. Explores data wrangling techniques often employed before visualization, such as `pivot_longer()`, `pivot_wider()`, and `fct_reorder()`. Discusses various customization options: `theme`, `legend`, `label`, and `annotate`, with examples written for POLS/CS&SS 510. Introduces useful extension packages, such as ggstance, ggrepel, and gghighlight.

Week 5: Intro to tile. Introduces simcf and tile. Revisit the concept of grid graphics in R. Works through various lineplots, scatterplots, and ropeladders of Chris's examples. Highlights functions and arguments such as `rugTile()`, `ropeladder(subentryheight = ...)`, and `(extrapolate = ...)`.

Week 6 - 9: Selected Topics on Data Visualization. Introduces various graphic designs and packages to visualize spatial, relational, and text data. Introduces interactive visual display with R Shiny.

Additional Resources

Healy (2018) provides a beginner-friendly introduction to R, R Markdown, and visualization using ggplot2. Wilke (2019) offers a wide variety of visualization techniques with helpful advices to diagnose suboptimal graphic practices. His book has a free online version, with source code on GitHub.

If you don't have an existing data project, consult the TidyTuesday project (Mock, 2018), which offers many interesting raw data sets, coding examples by community members, and is being updated weekly.

References

Healy, Kieran. 2018. Data Visualization: A Practical Introduction. Princeton University Press. p.4

Mock, Thomas. 2018. "TidyTuesday - A Weekly Social Data Project in R.".
URL: *https://github.com/rfordatascience/tidytuesday* p.4

Robinson, David. 2016. "Why I use ggplot2.".
URL: *http://varianceexplained.org/r/why-I-use-ggplot2/*

Wilke, Claus O. 2019. Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures. O'Reilly Media.
URL: *https://serialmentor.com/dataviz/* p.4

Yau, Nathan. 2016. "Comparing ggplot2 and R Base Graphics.".
URL: *https://flowingdata.com/2016/03/22/comparing-ggplot2-and-r-base-graphics/*