# Communicating Data
## BUAN 3210/4220 | 2020

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## COURSE DESCRIPTION

Data analytics is nearly useless if you are unable to clearly communicate what you have learned from the data. This course teaches the practical and technical skills necessary to communicate information about data clearly and effectively in written and visual form. Visualization is critical to both exploration and explanation, so the course will build both analytical and communication skills. Visualization promotes discovery, and what is discovered can be used for "storytelling" to effectively communicate, summarize, influence, explain, persuade and provide evidence to an audience. During the course students will learn conceptual, theoretical and technical skills that will enable them to learn from data, develop professional visualizations and empower them to communicate and share their findings.

## PREREQUISITES

The general course prerequisites include the Albers R/Python boot camp and introductory level statistics. We will use a combination of computer programs including Excel, R and Power BI, all are available on the Albers computers and available for download for SU students.

## LEARNING OUTCOMES

On successful completion of this course (i.e. by passing this course), you will be able to:
1. Apply technical skills to explore and understand data
2. Understand and apply principles of data visualization
3. Be proficient using software to develop data visualizations
4. Design and implement standard visualization techniques for communication
5. Develop professional graphics to explain findings and solutions
6. Perform "storytelling" with data for effective communication

This course meets the following Seattle University's learning outcomes:
- Demonstrate mastery of competencies required in their profession or field
- Demonstrate effective communication in speech and in writing
- Exhibit effective collaboration skills

This course meets the following among the Albers School's learning outcomes:
- Identify and describe complex business problems in terms of analytical models
- Communicate technical information to both technical and non-technical audiences in speech, in writing, and graphically
- Exhibit effective collaboration and leadership skills

# EXPECTATIONS

Treat classmates with respect! We will spend a significant portion of each class meeting actively working on data visualization principles and techniques. One of your most valuable resources will be other students in the class, so it is paramount that we create an open, supportive and collaborative learning environment. If you have a question it is very likely that many of your classmates either have or have recently figured a similar question. So please ask questions so you can learn from each other.

# TEACHING APPROACH:

There will be a combination of lecture and in-class activity. There will be assigned reading and activities prior to class, then a portion of class will be spent applying techniques from the assigned readings and activities.

# REQUIRED TEXT:

You are only required to purchase one text book; however, there are several online texts available that I encourage you to purchase to support the work of the author.

Storytelling with Data. Cole Nussbaumer-Knaflic. Wiley, 2015. ISBN: 978-1119002253. **Hardcopy** guide for creating clear, concise visuals for illustrating data, www.storytellingwithdata.com.

Data Visualization: A Practical Introduction. Kieran Healy. Princeton University Press, 2018. ISBN 978-069118162. Available at https://socviz.co/.

Fundamentals of Data Visualization. Claus O. Wilke. O'Riely, March 2019. ISBN: 978-1492031086. Detailed book on visualization and R. Available at https://serialmentor.com/dataviz/index.html

R for Data Science. Garret Grolemund and Hadley Wickham. O'Riely, 2016. ISBN: 978-1491910399. A guide to all stages of data science using R. Available at http://r4ds.had.co.nz/

R Graphics Cookbook, 2nd edition: Winston Chang. O'Reilly, 2019. ISBN: 978-1491978603. Covers examples of graph coding in R. Available at, https://r-graphics.org/

# RECOMMENDED:

There is simply too much material to cover in ten weeks, but I will be summarizing points from these texts as well.

An Introduction to Statistical Learning. Gareth James et al. Springer, 2013, ISBN-13:978-1461471387. Not a visualization book, but an excellent reference for statistical modeling, see associated web page www.StatLearning.com

Avoiding Data Pitfalls. Ben Jones. Wiley, 2020. ISBN-13: 978-1-119-27816-0, see https://dataliteracy.com/avoiding-data-pitfalls/.

Data Science for Business. Foster Provost and Tom Fawcett. O'Reilly, 2013. ISBN-13: 978-1449361327. Not a visualization book, but a good "big-picture" reference for business analytics.

Information Dashboard Design, 2nd edition. Stephen Few. Analytics Press, 2013. ISBN-13: 978-1938377006. Good for dashboard and interactive web design, see the associated web page www.preceptualedge.com

Now You See It. Stephen Few. Analytics Press, 2009. ISBN-13: 978-0970601988. Practical ways to analyze data graphically, see www.preceptualedge.com

Show Me the Numbers, 2nd edition. Stephen Few. Analytics Press, 2012. ISBN-13: 978-0970601971. Good for learning display in tables and graphs, see www.preceptualedge.com

The Big Book of Dashboards. Steve Wexler. Wily, 2017. ISBN-13: 978-1119282716, see https://bigbookofdashboards.com/.

The Visual Display of Quantitative Information, 2nd edition. Edward R. Tufte. Graphics Press, 2013. ISBN-13: 978-0-9613921-4-7. Seminal text on visualization.

## COMPUTER:

We will use laptops during each class meeting, you will need Excel, R, and PowerBI installed, or you can connect to the SU VDI at https://desktop.seattleu.edu/

## MATERIALS:

Course materials including assignments and links will be made available at the course web page on Canvas, which can be found at: http://seattleu.instructure.com.

## PARTICIPATION ASSIGNMENTS:

There will be 10+/- "in-class" assignments; each will contain basic analysis, graphing and writing worth 2 to 5 points each. These assignments are to be completed and submitted in or soon after class (unless you give prior notice that you cannot attend class). There will be significant discussion during these activities. You are encouraged work in small groups.

## QUICK PROJECTS:

There will be two short projects worth 30 points each. Students will be provided a data set and prompt; each will contain analysis, graphing, and communication, and will be detailed in separate handouts. One will be on an individual project and the other will be groups of two.

## MID/FINAL PROJECTS:

There are two individual take-home project assignments that will be covered in separate handouts. The goal of these projects is to develop deeper understanding of the course material by applying them to detail oriented projects. The midterm project will be done in groups of two and the final will be an individual project.

## GRADING:

Points will be assigned to individual assignments, not letter grades. A final grade will be assigned at the end of the term based on the student's total points and relative standing in class. A tentative grading schedule is below. Note that +/- grades are 3% from the range given below:

        A range: 90-100% of total points (A- 90-93%)
        B range:      80-89.9% of total points (B- 80-83%, B+ 87-89.9%)
        C range:      70-79.9% of total points (C- 70-73%, B+ 77-79.9%)
        D range:      60-69.9% of total points (D- 60-63%, D+ 67-69.9%)
        F range:      less than 59.9% of total points

This grading schedule is subject to change during the course of the quarter based on the overall performance of the class, but it will **NOT** be made more difficult.

        Grades will be based on the following assignment points:
        10+/− Participation Activities (2 to 5 points each, 30+/- points total)
        2      Quick Projects (25 points each, 50 points total)
        1      Mid-term Project (50 points)
        1      Final Project (70 points)
        200+/− Total assigned points

## SCHEDULE/OUTLINE:

A detailed schedule will be provided on a separate handout.

**Section I:** Introduction
1. Intro to communication and visualization
2. Grammar of graphics (ggplot2)
3. RMarkdown
4. The tidyverse and basic wrangling
5. Base and detailed EDA

**Section II:** Data wrangling and visualization
1. Formatting visuals
2. More data wrangling
3. Statistics and models

**Section III:** Technical communication
1. Storytelling with Data
2. Specialty visuals
3. Interactive visuals
4. Dashboards
5. Power BI

## ELECTRONIC DEVICES:

The use of laptops, netbooks or PDAs in class to take class-notes, view PowerPoints or work on class projects is encouraged. However, please do not use laptops, netbooks or PDAs (cellphones, hand-helds) in class for any non-class related activity (including instant messaging, web-browsing, etc.) unless specifically suggested by the instructor.

## ACADEMIC RESOURCES:

- Library and Learning Commons (http://www.seattleu.edu/learningcommons/)
  (This includes: Learning Assistance Programs, Research [Library] Services, Writing Center, Math Lab)
- Academic Integrity Tutorial (found on Canvas and SU Online)

## ACADEMIC POLICIES ON REGISTRAR WEBSITE:

- https://www.seattleu.edu/redhawk-axis/academic-policies/
- Academic Integrity Policy
- Academic Grading Grievance Policy
- Professional Conduct Policy (only for those professional programs to which it applies)

## NOTICE FOR STUDENTS CONCERNING DISABILITIES:

If you have, or think you may have, a disability (including an 'invisible disability' such as a learning disability, a chronic health problem, or a mental health condition) that interferes with your performance as a student in this class, you are encouraged to arrange support services and/or accommodations through Disabilities Services staff located in **Loyola 100, (206) 296-5740**. Disability-based adjustments to course expectations can be arranged only through this process.

## NOTICE REGARDING RELIGIOUS ACCOMMODATIONS:

It is the policy of Seattle University to reasonably accommodate students who, due to the observance of religious holidays, expect to be absent or endure a significant hardship during certain days of their academic course or program.

Please see, *Policy on Religious Accommodations for Students* (https://www.seattleu.edu/media/policies/Policy-on-Religious-Accommodations-for-Students---FINAL.PDF)."

## OFFICE OF INSTITUTIONAL EQUITY:

Title IX of the Education Amendments of 1972 (Title IX) prohibits discrimination based on sex in educational programs or activities that receive Federal financial assistance. This prohibition includes sexual misconduct, which encompasses sexual harassment and sexual violence. Seattle U remains committed to providing a safe and equitable learning, living, and working environment. Seattle U offers emergency, medical, and other support resources, as well as assistance with safety and support measures, to community members who have experienced or been impacted by sexual misconduct.

Seattle U requires all faculty and staff to notify the University's Title IX Coordinator if they become aware of any incident of sexual misconduct experienced by a student.

For more information, please visit https://www.seattleu.edu/equity/. If you have any questions or concerns, you may also directly contact the Title IX Coordinator in the Office of Institutional Equity (**email**: oie@seattleu.edu; **phone**: 206.296.2824) University Resources and Policies