Syllabus

ISQA 521: Data Visualization

# Instructor Information

**Instructor**: David W. Gerbing, Ph.D.  
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**Office Hours:**  Online Sunday 6pm; Office Wed 3:30-4:30

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→ For me to read and respond to your emails, place 521 somewhere in the subject line.   
→ Avoid D2L email because it is not real email. No response is possible outside of D2L.

Google Hangouts Video Conference: Bookmark – URL we use all term   
https://hangouts.google.com/hangouts/\_/pdx.edu/gerbing

# Course Description

This class overviews some of the most useful data visualizations, i.e., computer graphics, that are applied in modern data analytics via the languages R and Tableau. The R visualizations follow from what has emerged as the standard R visualization system, the ggplot2 package, as well as from my own R package, lessR. R runs the same on Windows, Macintosh or Linux/Unix. The last week of the course introduces the Tableau system, which unlike R, is not a general programming system, but does provide easy to use powerful graphics capabilities, in either Windows or Macintosh.

This course is a fully-online course, accessible at the D2L PSU site.   
If you have any difficulty entering the course or with D2L, please contact the [OIT Helpdesk.](https://www.pdx.edu/oit/contact)

Post questions about the course in the "General Questions" discussion forum. A peer may be able to quickly answer your question. I will also reply in the forum so that the entire class can benefit.

**Check the D2L announcements on a regular basis.**

# Course Objectives

# Upon completion of this course, students will understand the following areas:

# Define the steps in a data analytics project and understand the role of data visualization in this process, including as an outcome of the process for the communication of results.

# Learn to apply R and Tableau software packages to accomplish data analytics:.

# Know how to interpret the various types of graphs, and know which graphs are most applicable to different situations.

# Academic Connections of This Course

ISQA 521 is one of the required courses towards the completion of a [graduate-level certificate](https://www.pdx.edu/sba/business-intelligence-and-analytics-certificate) in Data Analytics. This course may also be used towards other degrees; please consult the [SB Department website](https://www.pdx.edu/sba/business-intelligence-and-analytics-certificate) and your adviser to learn more.

# Assignments & Grading

| Grade Item | Description | Grade Points |
| --- | --- | --- |
| Weekly Homework | Scope and final dues dates are in d2L calendar | 40 |
| Video Conference | See Rubric posted to course site | 5 |
| Project | Apply what was learned to a data set of your choosing | 55 |

# Homework

The key to success in this course is the ability to generate and understand the weekly homework. All students will work on the same assigned data sets.

# Video Conferences

Each student participates in a group video conference other students and your instructor.

# Project

The key assignment to demonstrate sufficient learning of the core principals is the course project. Here you apply and interpret what you learned in the homework to a data set of your choosing. You are free to work in just one of the course software systems of your choosing, or you can combine output from the different systems. The criterion is not what software you choose to use, but that you generate and interpret the range of graphs presented in class.

# Text

No text is required. I will provide notes that I am developing for a book to be published by CRC Press, *Data Visualization with R*, which are a further development based on the seminars that I presented at the annual International Winter School on Big Data, at the 3rd session at the University of Bari in Bari, Italy, 4th session at the Universitatea de Vest, Timisoara, Romania, and the [5th](http://bigdat2019.irdta.eu/) session at the University of Cambridge, Cambridge, England, January 2019.

# ISQA 521 Topic Outline

Week 1 [4/01] Introduction to R and R Graphics

Purpose, Principles and Best Practices of Data Visualization R Packages for Graphics: lessR, ggplot2  
R Data Types and Data Structures  
Read Data into R

Week 2 [4/8] R: Visualize Univariate and Bivariate Distributions

Univariate Continuous Distributions: Histograms, Densities, Scatterplots, Boxplots Univariate Categorical Distributions: Bar Charts, Scatterplots, Bubble Plots  
Joint Distributions: The Scatterplot Re-conceptualized and Generalized

Week 3 [4/15] R: Visualize Mapping Data, Time Series Data

Advanced Visualizations with ggplot2 Layers  
Geographical Maps with Superimposed Data Visualizations Time Series Visualizations with Forecasts

Week 4 [4/22] Interactive Data Visualizations

Introduction to Shiny  
The Shiny Environment  
Examples of Shiny Interactive Visualizations

Week 5 [4/29] Tableau Visualizations

The Tableau Environment, Data Access  
Univariate Distributions, Scatterplots and Time Series  
Drill Down Data Hierarchies with Aggregate Data Complete the Loop: Flow R Analytics Output into Tableau

More Stuff

# Plagiarism

Plagiarism of any kind – in term papers or examinations – or any other violation of academic honesty will be grounds for failure of this course.

The Student Conduct Code, which applies to all students, prohibits all forms of academic cheating, fraud, and dishonesty. These acts include, but are not limited to, plagiarism, buying and selling of course assignments and research papers, performing academic assignments (including cases and discussions) for other persons, unauthorized disclosure and receipt of academic information, and other practices commonly understood to academically dishonor. The code of conduct also describes standards of behavior for all student members of the campus community. Violation of the SCC may lead to disciplinary action. Students may obtain copies of the Student Conduct Code by contacting the campus judicial officer at (503) 725-4422, or by visiting her office in room 433 Smith Memorial Center

# Course Expectations

1. Engage in appropriate classroom behavior. In this online class, you are expected to:
   1. Treat your peers and your instructor with respect, tolerance, and professionalism. This includes being aware of “tone” when responding in writings to others in discussion boards and communications.
   2. Be dependable and responsible to your peers if assigned group activities.
   3. Contribute equitably and frequently to any small group & group assignments.
2. **Log in to your D2L course at least once every 24 hours to check for updates and to do work.**
3. Review all items in this course site thoroughly. Participate fully in all course activities. Read all assigned readings for this class at the beginning of the week and before you attempt to do assignments; submit all assignments on time. Late submissions are NOT accepted.
4. Demonstrate academic honesty. Review the [Student Conduct Code](https://www.pdx.edu/dos/resources-for-students) to know your rights and responsibilities as a member of the Portland State University community. This code describes behavior for which a student may be subject to disciplinary action. Academic dishonesty will not be tolerated. An act of academic dishonesty (e.g., cheating, plagiarism, misrepresenting or improper/no citing that leads the instructor/viewer of content to believe that the writing and content are original to you, or unauthorized possession of examinations will automatically result in a grade of “F” for the affected assignment and the case will be referred to university authorities. If you are still unclear as to what constitutes plagiarism, consult this [site explaining plagiarism](http://library.pdx.edu/diy/avoiding-plagiarism) from the PSU Library. When in doubt, cite the source. For assistance with APA citation format, see: [Purdue OWL: APA Formatting and Style Guide.](http://owl.english.purdue.edu/owl/resource/560/01/)

Make sure you keep electronic copies of all your assignments also outside of D2L so that you can produce them should the need arise.

# Accommodations for Learning Differences

If you have, or think you may have, a disability that may affect your work in this class, [register your needs](https://denali.accessiblelearning.com/PDX/) with the [Disability Resource Center](http://www.pdx.edu/drc/) (DRC) to initiate an accommodations support process. The DRC can be reached at (503) 725-4150 or [drc@pdx.edu](mailto:drc@pdx.edu). Once you have coordinated with the DRC, please contact me to make sure that I have received a faculty notification letter and we can discuss your needs for the term.

PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, usable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me.

# Academic Integrity

Review the [Student Conduct Code](https://www.pdx.edu/dos/resources-for-students) to become familiar with your rights, responsibilities and the behaviors for which a student may be subject to disciplinary action. An act of academic dishonesty (e.g., cheating, [plagiarism](http://guides.library.pdx.edu/cite), misrepresenting or improper/no citing that leads the instructor/viewer of content to believe that the writing and content are original to you, or unauthorized possession of examinations will automatically result in a grade of “F” for the affected assignment, and the case will be referred to university authorities. University authorities have the ability to escalate matters to the level of expulsion. Make sure you keep electronic copies of all your assignments also outside of D2L so that you can produce them should the need arise.

Many of PSU's online courses use the [Turnitin plagiarism assessment tool](https://www.pdx.edu/oai/turnitin-0) to evaluate assignments. This tool checks submissions against a database of published works, as well as other students' papers. You can review your Turnitin report before submitting an assignment and make necessary revisions. If you are still unclear as to what constitutes plagiarism, please review the [PSU Library's Citation Tutorial](https://portlandstate.qualtrics.com/SE/?SID=SV_a66OA7FVDVol1FX).

Online courses may also use remote proctoring to regulate behavior during exams. The School of Business uses an automated system called [Proctorio](https://get.proctor.io/). Proctorio works by documenting an instructor-customized combination of video, audio, open applications, and restriction of activities such as copy-paste and opening new browser tabs. If Proctorio identifies suspicious activity according to your instructor’s settings, it will flag the instance for a review. This service runs on the Chrome browser and gates access to specified quizzes directly within PSU’s learning management system. The School of Business covers the cost of this platform. Proctorio provides a American Disability Act and FERPA compliant user experience.

# Data Privacy

The Family Educational Rights and Privacy Act (FERPA) is a federal law that affords students certain rights with respect to their academic records, such as “the right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent.” FERPA protects students from having their information disseminated to third parties without consent.

In accordance with this law, Portland State University has adopted rules to govern the gathering, use, and disclosure of student records with the aim of guaranteeing the privacy of such records. Under the Student Record rules, most of the records that the University maintains with regard to a student can *only* be disclosed to the student, University officials, sponsors of disbursed financial aid, or government agencies upon receipt of lawful subpoenas.

## Online Proctoring and Data Privacy

Portland State University’s School of Business uses an automated, third party, remote proctoring service to monitor and regulate student behavior during online exams. The current service employed—Proctorio—never holds unencrypted academic records. All data that enters its system has been encrypted by PSU’s learning management system (LMS) according to user roles, and can only be unlocked by authorized instructors and campus administrators *within* the LMS. This restricts information from being shared with users who do not possess a PSU "School Official" role, preventing unauthorized individuals and Proctorio from accessing student data.

* Proctorio delivers all content via SSL (TLS 1.2), and their servers are compliant to PCI and HIPAA standards. Cookies used by the Services cannot be used to personally identify you.
* Proctorio never requests disclosure of PII. When going through technical support channels, representatives see student inquiries as unique, randomized identifiers according to institution. The service is accessible through PSU’s LMS, with costs assumed by The School of Business, meaning no secondary accounts or payment information.
* Proctorio is a Chrome extension that requires activation in order run within a section. This service only operates on specified quiz pages within the LMS.

# Title IX Reporting Policy

As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. We expect a culture of professionalism and mutual respect in our department and class. You may report any incident of discrimination or discriminatory harassment, including sexual harassment, to either the [Office of Equity and Compliance](https://www.pdx.edu/diversity/office-of-equity-compliance) or the [Office of the Dean of Student Life](https://www.pdx.edu/dos/student-conduct-at-psu).

Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If preferred, you can instead share information about sexual harassment or sexual violence with a [confidential employee](https://www.pdx.edu/sexual-assault/get-help) who does not have this reporting responsibility. For more information about Title IX, please complete the required student module [Creating a Safe Campus](https://www.pdx.edu/sexual-assault/safe-campus-module) in D2L.