

Gallogly College of Engineering
Data Science and Analytics
DSA 5051: Data Visualization
Summer 2020

Instructor: Matt Beattie

Office: Web

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Office Hours: Fridays, 9am – 11am CST by Microsoft Teams

Learning Management System: <https://Canvas.ou.edu>

Course Meeting Time and Location:

Online

Course Prerequisite:

Graduate standing in DSA/C S/ISE, Departmental Permission, DSA 5103 and DSA 4513 recommended

Course Delivery:

Online

Course Description:

Aspiring data scientists need to be able to communicate the stories of data to communities of interest. This usually requires the depiction of data in visualizations. The course combines an overview of best practices for visualizations with practical knowledge, including the use of Tableau and how to gather user requirements. After completing the course, students will be better able to support decision making with visualizations that communicate information in an easily consumable, yet richly informative, fashion.

Course Goals:

- 1. Become proficient at creating impactful visualizations and dashboards.*
- 2. Learn how to satisfy user needs with data stories*
- 3. Develop capability to design data platforms to support visualization tools.*

Learning Outcomes:

- Use Tableau software to produce a variety of visualizations and dashboards*
- Link Tableau visualizations to SQL databases residing in the cloud*
- Combine multiple visualizations into dashboards*
- Describe best practices for data visualization using Tufte's guidelines*
- Identify the best type of visualization to portray a dataset*
- Identify flaws in common visualizations and correct them*
- Use Tufte's guidelines to design original visualizations*
- Employ techniques to gather user requirements for data visualization*
- Assemble visualizations to develop a story from data*

Texts and Materials:

- Tableau Desktop Professional Edition – obtained via Tableau student license
- Microsoft Teams – supplied as part of OU’s Office365 subscription
- Required: Edward Tufte, The Visual Display of Quantitative Information (2d edition), ISBN-10: 9780961392147, ISBN-13: 978-0961392147. This book contains visualization design principles that are referenced by many other authors.
- Recommended: Ryan Sleeper, Practical Tableau, 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, ISBN: 1491977310. This book contains simple instructions on how to use Tableau and how to create many of the visualizations described by Tufte.

Teaching Philosophy:

The course consists of eight weeks of structured learning. There are two sessions each week. The first is a lecture on design, consulting practices, and techniques of visualization. The second is a lab where the lecture’s principles are illustrated using Tableau. Students are encouraged to experiment with datasets that are relevant to their areas of academic or professional interest in order to build skills that are quickly useful. Students are encouraged to, collaborate on assignments and labs.

Expectations:

Students are expected to view all lectures and labs and are expected to submit all assignments on time. Because this is a graduate level course, students are expected to become proficient with Tableau with little assistance. This course focuses on the application of data visualization best practices – tips on using Tableau are available in the recommended text, Tableau’s online knowledge base, and like any other software, via stackoverflow.

Students are also expected to contribute to any online discussions and will be evaluated on their participation in them. As mentioned above, collaboration is encouraged. The only assignment that may not be a collaboration is the final project. That assignment is to be based on individual efforts alone.

Learning Activities and Assessment

Student assessment will consist of brief written exercises, participation, and the completion of visualization assignments.

Final Grade:

The grade for this course will consist of four areas: participation (20%), written exercises (20%), labs (30%), and a final project (30%). All assignments will be assessed on a 100-point scale, and the final grade for the course will be calculated as follows:

- A: 90%-100%
- B: 80%-89%
- C: 70%-79%
- D: 60%-69%

Late assignments will be accepted but will lose 10 points for each calendar day late. The final project must be completed and submitted on time to count toward the final grade.

Tentative Schedule

Date(s)	Unit	Lecture	Lab	Assignments, Exams, or Readings
Wk 1	Introduction	Review course objectives, show examples of good and bad visualizations	Tableau installation, familiarization with software	Tableau Training Videos: Getting Started
Wk 2	Design Principles and Introduction to Storytelling	Discuss design principles. Determining visualization requirements	Crash tables, bar charts, and scatterplots	Reading: Tufte Lab 1
Wk 3	Basic Visualization Types	Definitions of basic visualization types and when to use them	Create sparklines, dual axis charts, and slope charts	Reading: Tufte Lab 2
Wk 4	Design: Advanced Visualizations and Maps	Reducing complexity with advanced visualization types. Using geographic data to depict data on maps	Create advanced charts. Create geographic heat maps and plots.	Lab 3
Wk 5	Consulting: User Needs Assessment	Discuss techniques to gather user requirements	Case study: a three-function user community	Written Assignment 2
Wk 6	Consulting: Dashboard Creation	Design multiple visualization dashboards for multiple-user audiences	Case study continued: the three function dashboard	Lab 4
Wk 7	Data Management	Data table design and data storage	Connect visualizations to SQL databases in the cloud	Lab 5
Wk 8	Storytelling	Storyboarding and visualizations to make a recommendation	Case study: the role of non-prescription opioids in the addiction crisis	Final project

Additional Support for Learning

The instructor will conduct office hours to support students. Additionally, the instructor will respond to email inquiries as best as possible, usually within 24 hours. Students are encouraged to use the Teams chat forum to submit questions, gather help from peers, and otherwise communicate.

Course Policies

In this section, spell out what are your expectations for late work, attendance, and other course specific policies.

Make-up Policy

In this section, you should clearly state a make-up policy that is in agreement with the relevant statements in the Faculty Handbook. [\[See Faculty Handbook 4.7, 4.9, 4.10, and 4.11\]](#)

Absences

In this section, you should clearly state an attendance policy that is in agreement with the relevant statements in the Faculty Handbook. [\[See Faculty Handbook 4.19\]](#)

Other Policies: Civility, Emergency Contact, Late Assignments

University Policies

In this section, include the mandatory University policies. (Examples are provided below.)

Academic Integrity

Students must adhere to the OU Academic Integrity guidelines (<http://www.ou.edu/integrity>). Cheating is strictly prohibited at the University of Oklahoma, because it devalues the degree you are working hard to get. As a member of the OU community it is your responsibility to protect your educational investment by knowing and following the rules. For specific definitions on what constitutes cheating, review the Student's Guide to Academic Integrity at http://integrity.ou.edu/students_guide.html.

You will rarely be asked in your academic or professional career to work completely independently. Therefore, I've set the class up to allow you to work together. The final project is how I am differentiating your performance as appropriate. The work on that project must be your own. If it isn't, that's cheating. So, let's not do that.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty.
[\[See Faculty Handbook 3.15.2\]](#)

Reasonable Accommodation Policy

Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website <http://www.ou.edu/drc/home.html> Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

Title IX Resources and Reporting Requirement

For any concerns regarding gender-based discrimination, sexual harassment, sexual assault, dating/domestic violence, or stalking, the University offers a variety of resources. To learn more or to report an incident, please contact the Sexual Misconduct Office at 405/325-2215 (8 to 5, M-F) or smo@ou.edu. Incidents can also be reported confidentially to OU Advocates at 405/615-0013 (phones are answered 24 hours a day, 7 days a week). Also, please be advised that a professor/GA/TA is required to report instances of sexual harassment, sexual assault, or discrimination to the Sexual Misconduct Office. Inquiries regarding non-discrimination policies may be directed to: Bobby J. Mason, University Equal Opportunity Officer and Title IX Coordinator at 405/325-3546 or bjm@ou.edu. For more information, visit <http://www.ou.edu/eoo.html>.

Adjustments for Pregnancy/Childbirth Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact your professor or the Disability Resource Center at 405/325-3852 as soon as possible. Also, see <http://www.ou.edu/eoo/faqs/pregnancy-faqs.html> for answers to commonly asked questions.

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy (<https://apps.hr.ou.edu/FacultyHandbook#4.10>).