

University of Oklahoma
Gallogly College of Engineering
Data Science and Analytics
DSA 5051: Data Visualization

Instructor: Matt Beattie

Office: Building Number

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Office Hours: Fridays, 9am-10:00am CST by Microsoft Teams

Learning Management System: canvas.ou.edu

Course Meeting Time and Location:

Online

Course Prerequisite:

DSA5103, DSA4513 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*
- Identify the best type of visualization to portray a dataset*
- Identify flaws in common visualizations and correct them*
- 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.
- Recommended: Cole Nussbaumer Knaflic, Storytelling with data: a data visualization guide for business professionals, ISBN: 9781119002253. This book recasts many of Tufte’s recommendations in a practical way. It has a very good section on storytelling.

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.

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. Graded assignments should be a result of each student’s independent effort.

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 two areas: seven assignments (70%) 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.

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.

Late Submission Policy

Work submitted late will be deducted by one letter grade for every day past the due date. Work submitted after four days will NOT receive credit.

University Policies

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>).

Emergency Protocol

During an emergency, there are official university [procedures](#) that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather *1. LOOK* for severe weather refuge location maps located inside most OU buildings near the entrances *2. SEEK* refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building. *3. GO* to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows. *4. GET IN, GET DOWN, COVER UP.* *5. WAIT* for official notice to resume normal activities.

[Link to Severe Weather Refuge Areas](#) , [Severe Weather Preparedness - Video](#)

Armed Subject/Campus Intruder: If you receive an OU Alert to shelter-in-place due to an active shooter or armed intruder situation or you hear what you perceive to be gunshots:

1. GET OUT: If you believe you can get out of the area WITHOUT encountering the armed individual, move quickly towards the nearest building exit, move away from the building, and call 911. *2. HIDE OUT:* If you cannot flee, move to an area that can be locked or barricaded, turn off lights, silence devices, spread out, and formulate a plan of attack if the shooter enters the room. *3. TAKE OUT:* As a last resort fight to defend yourself.

For more information, visit <http://www.ou.edu/emergencypreparedness.html>

[Shots Fired on Campus Procedure - Video](#)

Fire Alarm/General Emergency: If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates: 1. *LEAVE* the building. Do not use the elevators. 2. *KNOW* at least two building exits 3. *ASSIST* those that may need help 4. *PROCEED* to the emergency assembly area 5 *ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues.* 6. .*WAIT* for official notice before attempting to re-enter the building.

[*OU Fire Safety on Campus*](#)

Date(s)	Unit	Lecture	Lab	Assignments, Exams, or Readings
Wk 1	Introduction	Review course objectives, show examples of good and bad visualizations	Lab 1: The Tableau Interface	Read: Tufte 1-52 Assignment 1: Installing Tableau and Critiquing Charts
Wk 2	Graphical Excellence and Integrity	Discuss design principles. Determining visualization requirements	Lab 2: Connecting to Data Sources	Read: Tufte 53-87, Knaflic 19-34 Assignment 2: Connecting to Data Sources
Wk 3	Basic Visualization Types	Definitions of basic visualization types and when to use them	Lab 3: Creating Basic Visualizations	Read: Tufte 91-105, Knaflic 35-70 Assignment 3: Basic Visualizations
Wk 4	Maps	Learn how maps can communicate complex datasets that incorporate location.	Lab 4: Creating Maps	Read: Tufte 106-189 Assignment 4: Maps
Wk 5	Interactivity	Show how interactivity enhances users' data exploration	Lab 5: No lab this week	Read: Heer and Shneiderman (2012) Assignment 5: Building the Police Shooting Visualizations
Wk 6	Dashboards	Learn when to create dashboards and understand how they apply in a cross-functional group	Lab 6: Building Dashboards	Read: Few (2004), Few (2007) Assignment 6: A Dashboard for LAX
Wk 7	Data Management	Learn how good data table design and data storage support visualizations	Lab 7: Data Management	Read: Siberschatz (2011) Assignment 7: Data Management
Wk 8	Storytelling	Storyboarding and visualizations to make a recommendation	Lab 8: No lab this week	Read: Knaflic 71-126, 165-205 Final Project