

ITLS 4130 DATA VISUALIZATION

COURSE DESCRIPTION

This course introduces data literacy required as a key twenty-first century skill. You will learn the nature of data across different domains and the concepts and skills of data visualization by understanding, questioning, and problematizing how data are generated, analyzed, and used. You will be able to apply its concepts and skills to visualize your own data, interpret the findings, and examine the impacts of data-driven decision. (Prerequisites: STAT 1040)

COURSE INFORMATION

Instructor: [Jina Kang](#)

Email: jina.kang@usu.edu (Email is the quickest way to reach me.)

Office: Online

Office Hours: By appointment via Zoom or phone

COURSE OBJECTIVES AND OUTCOMES

OBJECTIVES (IDEA LEARNING OBJECTIVES)

1. Gaining a basic understanding of the subject (e.g., factual knowledge, methods, principles, generalizations, theories)
2. Learning to analyze and critically evaluate ideas, arguments, and points of view.
3. Learning appropriate methods for collecting, analyzing, and interpreting numerical information
4. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course

BY THE END OF THIS COURSE, YOU WILL BE ABLE TO:

1. Understand the fundamental design principles and different types of data visualization.
2. Identify both positive and negative impacts of data-informed decision across a variety of domains.
3. Apply the fundamental concepts of data visualization to define a project in your field of study.
4. Practice the core principles using widely available tools (e.g. Tableau).
5. Demonstrate the best practice that presents your story in the process of creating data visualization including connecting to different data sources, assessing to the quality of the data, and converting raw data into data visualizations that provide actionable information.

COURSE STRUCTURE

This course will be delivered in an **online learning mode**. The contexts for this course will be primarily interactive, collaborative, multi-disciplinary, and student-centered. This means that you can access the learning materials and activities via Canvas in your own time, but you will need to follow the weekly module schedule. Be sure to check the due dates and times for each week. When you access the course website on Canvas, you'll notice that the course is structured by weeks. For the further information, please see **Course Outline** at the end of this syllabus, and click on **Modules** in the left-side navigation menu to see the details of all weeks. I will use a Weekly Overview document to give you an overview of the week and explain the required tasks for the week with due dates and times. It's your responsibility to check and follow them. Each week lasts 7 days (**Tuesday to Monday**). A weekly module will be available on **Monday at 6pm**. For example, you can see the Week 3 module on Sep. 14 at 6pm.

COURSE RESOURCES

Textbook: There is no required textbook for this course. All required readings and/or videos will be provided on the course site, Canvas.

Tools to Learn: Tableau offers a free one-year Tableau license to students. Please download it here: <https://www.tableau.com/academic/students>

If you would like to learn other advanced tools (e.g., R, Python, JavaScript), please discuss it with me by the end of Week 4.

PERFORMANCE EVALUATION

Performance Outcomes (Total 100%, Total 200 points)

- Weekly Assignments (50%, 120 points)
- Individual Course Project (50%, 80 points)

See the detailed guideline and rubric in each assignment in the [Assignments](#) page (each assignment will be published at least 2-3 weeks prior to the due date). All assignments are **due by 11:59pm on the following Monday** unless there is a specific date/time assigned.

GRADE SCHEME

The following grading standards will be used in this class:

Grade	Range
A	100 % to 93.0%
A-	< 93.0 % to 90.0%
B+	< 90.0 % to 87.0%
B	< 87.0 % to 83.0%
B-	< 83.0 % to 80.0%

Grade	Range
C+	< 80.0 % to 77.0%
C	< 77.0 % to 73.0%
C-	< 73.0 % to 70.0%
D+	< 70.0 % to 67.0%
D	< 67.0 % to 60.0%
F	< 59.0 % to 0.0%

LAKE WORK POLICY

All work is due based on the specified due-dates except in emergency situations (family emergency, illness, or participation in a university sponsored activity). A late assignment without an excuse will lead to a zero grade on the assignment. Prior to the assignment due date, you should email a written excuse to your instructor to be considered excused. This policy is in effect as an incentive to stay current with the assigned work. Like many courses, the work of one session is based on understanding the work of the previous sessions. Falling behind in the work greatly reduces the chances of success at attempting later work.

CANVAS INFORMATION

Canvas is the where course content, grades, and communication will reside for this course.

- <http://canvas.usu.edu>
 - Your **username** is your **A#**, and your **password** is your global password (the same one you use for Banner or Aggiemail).
- For [Canvas](#), [Passwords](#), or any other computer-related technical support contact the [IT Service Desk](#).
 - 435 797-4357 (797-HELP)
 - 877 878-8325
 - <http://it.usu.edu>
 - servicedesk@usu.edu

CLASSROOM CIVILITY

Utah State University supports the principle of freedom of expression for both faculty and students. The University respects the rights of faculty to teach and students to learn. Maintenance of these rights requires classroom conditions that do not impede the learning process. Disruptive classroom behavior will not be tolerated. An individual engaging in such behavior may be subject to disciplinary action. Read [Student Code Article V Section V-3](#) for more information.

UNIVERSITY POLICIES & PROCEDURES

COVID-19 CLASSROOM PROTOCOLS

In order to continue to provide a high standard of instruction at USU, and to limit the spread of COVID-19 during the pandemic, students are asked to follow certain classroom protocols during the fall 2020 semester. These protocols are in place not only for your safety but also the safety of the rest of the campus community. You will be asked to clean your desk area at the start of each class, sit in designated seats, wear face coverings, and follow dismissal instructions. There may be individual medical circumstances that prevent some students from using face coverings. These circumstances will be rare, but if they do exist, we ask that everyone be respectful. It is imperative that we each do our part so that on-campus instruction can continue.

ACADEMIC FREEDOM AND PROFESSIONAL RESPONSIBILITIES

Academic freedom is the right to teach, study, discuss, investigate, discover, create, and publish freely. Academic freedom protects the rights of faculty members in teaching and of students in learning. Freedom in research is fundamental to the advancement of truth. Faculty members are entitled to full freedom in teaching, research, and creative activities, subject to the limitations imposed by professional responsibility. [Faculty Code Policy #403](#) further defines academic freedom and professional responsibilities.

ACADEMIC INTEGRITY – "THE HONOR SYSTEM"

Each student has the right and duty to pursue his or her academic experience free of dishonesty. To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge:

"I pledge, on my honor, to conduct myself with the foremost level of academic integrity."

A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge:

- Espouses academic integrity as an underlying and essential principle of the Utah State University community;
- Understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and
- Is a welcomed and valued member of Utah State University.

ACADEMIC DISHONESTY

The instructor of this course will take appropriate actions in response to Academic Dishonesty, as defined the University's Student Code. Acts of academic dishonesty include but are not limited to:

- **Cheating:** using, attempting to use, or providing others with any unauthorized assistance in taking quizzes, tests, examinations, or in any other academic exercise or activity. Unauthorized assistance includes:
 - Working in a group when the instructor has designated that the quiz, test, examination, or any other academic exercise or activity be done "individually;"
 - Depending on the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments;
 - Substituting for another student, or permitting another student to substitute for oneself, in taking an examination or preparing academic work;

- Acquiring tests or other academic material belonging to a faculty member, staff member, or another student without express permission;
- Continuing to write after time has been called on a quiz, test, examination, or any other academic exercise or activity;
- Submitting substantially the same work for credit in more than one class, except with prior approval of the instructor; or engaging in any form of research fraud.
- **Falsification:** altering or fabricating any information or citation in an academic exercise or activity.
- **Plagiarism:** representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes using materials prepared by another person or by an agency engaged in the sale of term papers or other academic materials.

For additional information go to: [ARTICLE VI. University Regulations Regarding Academic Integrity](#).

SEXUAL HARASSMENT/TITLE IX

Utah State University is committed to creating and maintaining an environment free from acts of sexual misconduct and discrimination and to fostering respect and dignity for all members of the USU community. Title IX and [USU Policy 339](#) address sexual harassment in the workplace and academic setting.

The university responds promptly upon learning of any form of possible discrimination or sexual misconduct. Any individual may contact USU's [Office of Equity](#) for available options and resources or clarification. The university has established a complaint procedure to handle all types of discrimination complaints, including sexual harassment ([USU Policy 305](#)), and has designated the Office of Equity Director/Title IX Coordinator as the official responsible for receiving and investigating complaints of sexual harassment.

WITHDRAWAL POLICY AND "I" GRADE POLICY

Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term 'extenuating' circumstances includes: (1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

STUDENTS WITH DISABILITIES

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the [Disability Resource Center \(DRC\)](#) as early in the semester as possible (University Inn # 101, (435) 797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Students who are at a higher risk for complications from COVID-19 or who contract COVID-19 may also be eligible for accommodations.

DIVERSITY STATEMENT

Regardless of intent, careless or ill-informed remarks can be offensive and hurtful to others and detract from the learning climate. If you feel uncomfortable in a classroom due to offensive language or actions by an instructor or student(s) regarding ethnicity, gender, or sexual orientation, contact:

- Division of Student Affairs: <https://studentaffairs.usu.edu>, (435) 797-1712, studentservices@usu.edu, TSC 220
- Student Legal Services: <https://ususa.usu.edu/student-association/student-advocacy/legal-services>, (435) 797-2912, TSC 326,
- Access and Diversity: <http://accesscenter.usu.edu>, (435) 797-1728, access@usu.edu; TSC 315
- Multicultural Programs: <http://accesscenter.usu.edu/multiculture>, (435) 797-1728, TSC 315
- LGBTQA Programs: <http://accesscenter.usu.edu/lgbtqa>, (435) 797-1728, TSC 3145
- Provost's Office Diversity Resources: <https://www.usu.edu/provost/diversity>, (435) 797-8176

You can learn about your student rights by visiting:

The Code of Policies and Procedures for Students at Utah State University: <https://studentconduct.usu.edu/studentcode>

GRIEVANCE PROCESS

Students who feel they have been unfairly treated may file a grievance through the channels and procedures described in the Student Code: [Article VII](#).

Full details for USU Academic Policies and Procedures can be found at:

- [Student Conduct](#)
- [Student Code](#)
- [Academic Integrity](#)
- [USU Selected Academic Policies and Procedures](#)
- [USU Academic Policies and Procedures](#)
- [Academic Freedom and Professional Responsibility Policy](#)

EMERGENCY PROCEDURES

In the case of a drill or real emergency, classes will be notified to evacuate the building by the sound of the fire/emergency alarm system or by a building representative. In the event of a disaster that may interfere with either notification, evacuate as the situation dictates (i.e., in an earthquake when shaking ceases or immediately when a fire is discovered). Turn off computers and take any personal items with you. Elevators should not be used; instead, use the closest stairs.

MENTAL HEALTH

Mental health is critically important for the success of USU students. As a student, you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events

may lead to diminished academic performance or reduce your ability to participate in daily activities. Utah State University provides free services for students to assist them with addressing these and other concerns. You can learn more about the broad range of confidential mental health services available on campus at [Counseling and Psychological Services \(CAPS\)](#).

Students are also encouraged to download the “[SafeUT App](#)” to their smartphones. The SafeUT application is a 24/7 statewide crisis text and tip service that provides real-time crisis intervention to students through texting and a confidential tip program that can help anyone with emotional crises, bullying, relationship problems, mental health, or suicide related issues.

COURSE OUTLINE

Week	Topic	Activities [W] Weekly Activity, [P] Course Project	Class Materials (1,2,3Please read details in <i>Notes</i> below)
Week 1	Introduction to data visualization	[W] Introduce yourself [W] Data visualization in everyday life [W] What makes a good visualization?	[Read] • Designing Great Visualizations: https://www.tableau.com/sites/default/files/media/designing-great-visualizations.pdf [Listen] • What is data visualization, a podcast by Cole Nussbaumer Knaflic
Week 2	Principles for data visualization	[W] Reading reflection: Concept Map & Peer Feedback	[Read] Read 2 articles assigned to you ¹ <ul style="list-style-type: none"> The Visual Display of Quantitative Information (2nd ed.), Edward Tufte (Read pp. 53-77 & 107-121) The Elements of Graphing Data (1985) by William S. Cleveland (Read pp. 24-55 & 68-88) The Truthful Art: Data, Charts, and Maps for Communication by Alberto Cairo (Read pp. 41-65 & 121-149)
Week 3	Data literacy	[W] Reading reflection: Reading Guide [P] Pick a data set	[Read] Read 1 article assigned to your group reading guide ¹ <ul style="list-style-type: none"> D'Ignazio, C. (2017). Creative data literacy. <i>Information Design Journal</i>, 23(1), 6-18. Pangrazio, L. & Sefton-Green, J. (2020). The social utility of 'data literacy'. <i>Learning, Media, and Technology</i>, 45(2), 208-220. [Read] <ul style="list-style-type: none"> One Dataset, Visualized 25 Ways: https://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/ [Watch] <ul style="list-style-type: none"> [Optional]³ Creative Data Literacy with Animated GIFs and Public Art by D'Ignazio, C.: https://www.youtube.com/watch?v=4uArFhp0MLw
Week 4	Introduction to Tableau	[W] Tableau Practice: Basics [P] Proposal draft	[Watch & Practice] <ul style="list-style-type: none"> Tableau tutorial videos Getting started (25 mins): https://www.tableau.com/learn/tutorials/on-demand/getting-started?playlist=554268&signin=4bec05bc7a876b95af7722b08fff9224

			<ul style="list-style-type: none"> The Tableau Interface (4 mins): https://www.tableau.com/learn/tutorials/on-demand/tableau-interface?playlist=554268 <p>[Read & Practice]</p> <ul style="list-style-type: none"> Visual Analytics with Tableau: Chapter 1: Introduction and Getting Started with Tableau (pp. 1-23) <p>[Read]</p> <ul style="list-style-type: none"> Knaflic, C. N. (2015). Storytelling with data: Chapter 2: choosing an effective visual (pp. 35-70)
Week 5	Multivariate visualization	<p>[W] Multivariate Storytelling</p> <p>[P] Peer feedback: Proposal draft</p> <p>[P] Tool selection</p>	<p>[Read] Choose 3 articles to read²</p> <ul style="list-style-type: none"> Multivariate data visualization and the limits of human perception: https://uxdesign.cc/multivariate-data-visualization-and-the-limits-of-human-perception-60ad47b4f59f The Art of Effective Visualization of Multi-dimensional Data: https://towardsdatascience.com/the-art-of-effective-visualization-of-multi-dimensional-data-6c7202990c57 An Introduction to Visual Multivariate Analysis: https://www.perceptualedge.com/articles/b-eye/visual-multivariate-analysis.pdf 30 Years of Multidimensional Multivariate Visualization: https://pdfs.semanticscholar.org/6b2a/08d0085c5513c76fb110fb4c7b554eee9344.pdf
Week 6	Tableau: Multivariate visualization	<p>[W] Tableau Practice: Multivariate Visualization</p> <p>[P] Final proposal</p>	<p>[Watch & Practice]</p> <ul style="list-style-type: none"> Tableau how-to videos: https://public.tableau.com/en-us/s/resources (31 mins) <ul style="list-style-type: none"> 7. Data Preparation – The Data Interpreter (4:29) 8. Data Preparation – Pivoting your Data (4:54) 9. Data Preparation – Splitting your Data (2:26) 10. Data Preparation – Joins and Unions (6:28) 11. Creating Your First Chart (2:34) 12. Using the Show Me Tool Bar (4:15) 13. Understanding the Logic of Charts (5:05) <p>[Read & Practice]</p> <ul style="list-style-type: none"> Visual Analytics with Tableau: Chapter 3: Creating Data Visualizations (pp. 49-77)
Week 7	Geospatial visualization	<p>[W] Geospatial Storytelling</p> <p>[W] Reading reflection: Reading Guide</p>	<p>[Read] Read 1 article assigned to your group reading guide¹</p> <ul style="list-style-type: none"> Buslik, M., & Maltz, M. (1998). Power to the people: Mapping and information sharing in the Chicago Police Department. Crime Mapping and Crime Prevention. Crime Prevention Studies, 8, 113-130. Downs, R. M. (2016). Bringing geography back to life: The role of the geospatial revolution in the US school system. Geography, 101(2), 77-84. <p>[Watch]</p> <ul style="list-style-type: none"> Geospatial Revolution (18 mins): https://youtu.be/9F7z9LLYxf8

Week 8	Tableau: Geospatial visualization	[W] Tableau Practice: Geospatial Visualization [P] Data visualization #1 [W] Midpoint check-in	[Read & Practice] Choose one of the materials ² <ul style="list-style-type: none"> Maps and Geographic Data Analysis in Tableau: https://help.tableau.com/current/pro/desktop/en-us/maps.htm Visual Analytics with Tableau: Chapter 6: Maps (pp. 131-154) [Watch/Practice] <ul style="list-style-type: none"> Mapping (12 videos): https://www.tableau.com/learn/training/20203
Week 9	Interactive visualization	[W] Reading reflection: Reading Guide [P] Peer feedback: Data visualization #1	[Read] Read 1 or 2 readings assigned to your group ¹ <ul style="list-style-type: none"> Few, S. (2007). Data visualization - Past, present, and future. 2-11. Swayne, D., & Klinke, S. (1999). Introduction to the special issue on interactive graphical data analysis: What is interaction? Computational Statistics, 14, 1-6. (Read 3. Interaction: What is it?) M. C., & Roth, S. F. (1996, October). On the semantics of interactive visualizations. In Proceedings IEEE Symposium on Information Visualization'96 (pp. 29-36). IEEE. [Read] <ul style="list-style-type: none"> 2019: The Year in Visual Stories and Graphics: https://www.nytimes.com/interactive/2019/12/30/us/2019-year-in-graphics.html
Week 10	Tableau: Dashboard and Story	[W] Tableau Practice: Dashboard and Story [P] Revision - Data visualization #1	[Read & Practice] <ul style="list-style-type: none"> Create Dashboards: https://help.tableau.com/current/pro/desktop/en-us/dashboards.htm Create Stories: https://help.tableau.com/current/pro/desktop/en-us/stories.htm
Week 11	Critiques in data visualization	[W] How charts lie [P] Data visualization #2	[Watch or Listen] Choose one of the materials ² <ul style="list-style-type: none"> How Charts Lie: Getting Smarter about Visual Information: The closing keynote by Alberto Cairo Alberto Cairo & How charts lie, a podcast by Cole Nussbaumer Knaflic [Read] <ul style="list-style-type: none"> Szafir, D. A. (2018). The good, the bad, and the biased: five ways visualizations can mislead (and how to fix them). interactions, 25(4), 26-33.
Week 12	Data visualization with ethics	[W] Reading reflection: Reading Guide [P] Peer feedback: Data visualization #2	[Read] Read 1 article assigned to your group reading guide ¹ <ul style="list-style-type: none"> Hand, D. J. (2018). Aspects of data ethics in a changing world: Where are we now? Big data, 6(3), 176-190. Drew, C. (2016). Data science ethics in government. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 374(2083), 20160119. [Optional]³ Tech's Ethical 'Dark Side': Harvard, Stanford and Others Want to Address: https://www.nytimes.com/2018/02/12/business/computer-science-ethics-courses.html

Week 13	Work on your project	[P] Revision - Data visualization #2	
Week 14	Work on your project	[P] Work on your project	
Week 15	Final project submission	[P] Final submission	

Notes: ¹If there is any indication of assigned materials, you should check the weekly overview page in Modules to see your assignment. ²You can choose the indicated number of materials in the list. ³Any material with [Optional] is not a required material, however, I recommend you to go through the material to better understand the week's contents.