MSIS 2629: Dashboards

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Contents

Motivation

This course enables you to **transform data into persuasive dashboards** that effectively inform and guide management actions. Dashboards are **persuasive** if they motivate actions in an intended audience. Dashboards are **effective** if they offer comprehensive and reliable information. This course introduces and discusses the fundamental design principles and technology of dashboards and allows you to design, implement, and critique dashboards. In a data-rich environment, where decision-makers often drown in data but thirst for insight [1], mastering this course equips you with a moderate level of data literacy.

Data literacy is the ability to interpret, construct, and convey arguments through the functional and truthful visual presentation of data. Data literacy is a **vital skill** in our data-driven world. The chances

[1] Loosely based on Naisbitt, J. 1982: Megatrends, Warner Books

are high that you will be interpreting and designing dashboards throughout your career. The level of data literacy offered through this course allows you to establish a **competitive advantage in Silicon Valley and the global marketplace**.

Learning objectives

You will learn to design and implement dashboards and critique the persuasiveness and evidence of dashboards. Upon successful completion of this course, you will:

- Understand the conceptual and technological fundamentals of dashboards.
- Analyze and understand the persuasiveness and evidence of dashboards.
- Implement persuasive and evidence-based dashboards.

Course Logistics

Textbook

There is **no** required textbook for this class. However, I highly recommend that you get a copy of the following book:

Sleeper (2018): Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, O'Reilly.

This book provides a great introduction to data visualization with Tableau. Furthermore, the book contains a great collection of examples and how-tos that will inspire your dashboards.

Further literature

Beyond that, data visualization is a fluid topic that is covered in arts, design, and technology. You will find a lot of "conventional wisdom" out there (including in the books below). Please consume information with a critical mind.

I consider the following books as *my* 'common core' of contemporary data visualization:

The philosophy of data visualization:

- Tufte (2001): The Visual Display of Quantitative Information, Graphic Press.
  - This book is a classic introduction to visual data representations.
  - This book is available as a hard copy in the SCU library.
- Tufte (2006): Beautiful Evidence, Graphic Press.
  - This book contains showcases that illustrate the thinking behind high-quality data visualizations.
  - This book is available as a hard copy in the SCU library.

The concepts of data visualization:

- Cairo (2012): The Functional Art: An Introduction to Information Graphics and Visualization, New Riders.
  - This book provides you with the conceptual background of data visualization.
  - This book is available online in the SCU library.
- Cairo (2016): The Truthful Art: Data, Charts, and Maps for Communication, New Riders.
  - This book is the sequel to the first one and focuses on the 'truthful' part.
  - This book is available online in the SCU library.

The practice of data visualization:

- Nussbaumer Knaflic (2015): Storytelling with data. Wiley.

  - This book focuses on the use of data visualization in the professional environment.
  - This book is available online in the SCU library.
- Wexler, Shaffer, Cotgrave (2017): The Big Book of Dashboards, Wiley.
  - This book is an excellent collection of dashboards and the reasoning behind them.

Technology

The hands-on elements in this course use **Tableau Desktop** and **Tableau Prep**.

- Tableau Desktop is an analytics platform for enterprise data.
- https://www.tableau.com/learn/training offers great resources to get started and to get answers on "how-to" questions.

You can download a test version of Tableau Desktop, but I highly recommend that you apply for a student license. A student license enables you to use Tableau Desktop for a full year!

Steps to obtain **Tableau Desktop** and **Tableau Prep**:

1. Obtain a student license here and follow the instructions that you receive: https://www.tableau.com/academic/students#form
2. Download Tableau Desktop here: https://www.tableau.com/products/desktop/download (You may have to enter your school email)
3. Download Tableau Prep here: https://www.tableau.com/products/desktop/download (You may have to enter your school email)
4. Enter the license key that you received to Tableau Desktop under Help > Manage Product Keys (You may need to register).
5. Ensure that the license key is active in Tableau Prep as well (You may need to register).

Additionally, please sign up for Tableau Public here: https://public.tableau.com/s/#modal-signin. Tableau Public the online portal of Tableau to showcase your work.

PLEASE NOTE: I expect you to have Tableau Desktop installed on your laptop and ready to go.

Communication

I am committed to your learning success. Please feel free to contact me with any questions regarding this course. If I am not able to help you myself, I will forward your request to someone who can.

1. If you have general questions about course material, assignments, etc. please use the Slack workspace for the course. You will find the invitation link in Camino.
2. Before you write an email, please search, read, and comment in Slack.
3. If you send me an email that contains questions of interest to the whole class, I will answer them in the Slack workspace.
4. My **office hours** are **Mondays and Wednesdays from 7:30 PM to 8:30 PM** (right after the class meetings). Please make an appointment in the Office Hours Calendar.
5. Please make an appointment whether you want to meet during office hours or outside of my office hours. A meeting request must have a specific agenda. I am available via Slack (preferred), zoom, or face-to-face.
6. I post all course material, course information, announcements, and updates on Camino. On Camino, you will also find the class recordings. Please make sure that your correct email address is listed in Camino so that you do not miss important information.
7. I maintain a Class Log (accessible only with SCU ID) that contains all the links, resources, and whiteboard drawings that I use or create during the class meetings.

Class Meetings

Class meetings are Mondays and Wednesdays, 5:45 PM to 7:20 PM in Lucas Hall 310.

This course offers a **reflective** and **practical** approach to dashboard design. Mondays are devoted to discussing design principles in data visualization. Wednesdays are lab sessions. During the lab session, you have the opportunity to work on a **dashboard case study** that allows you to practice the application of the design principle and technology. At the end of each lab session, **you may be asked to present your results**.

Course Schedule

The following table shows the schedule for the course and the assignments per week. Numbers in parentheses denote the maximum number of points you can achieve for the assignments).

Week	Class Meeting	Date	Topic	Tableau Quiz	Guided Project	Final Project
1	1	09/23	Introduction & Fundamentals	-	-	-
1	2	09/25	Lab	TQ1 (10)	-	-
2	3	09/30	Exploring & Analyzing Data	-	-	-
2	4	10/02	Lab	TQ2 (10)	GP1 (10)	-
3	5	10/07	Calculations & Analytics	-	-	-
3	6	10/09	Lab	TQ3 (10)	GP2 (10)	-
4	7	10/14	Dashboard Design	-	-	-
4	8	10/16	Lab	-	GP3 (10)	-
5	9	10/21	Design Thinking	-	-	-
5	10	10/23	Final Project Lab	-	-	FP (40)
			Total = 100 points	**30**	**30**	**40**

Assignments

> *"What it boils down to is one percent inspiration and ninety-nine percent perspiration." (Thomas Edison)*

The courses comes with a set of Tableau quizzes, a guided project, and a final project to assess your mastery of the learning objectives. There will be **no exams**.

- **Tableau quizzes are due on Sunday at 11:59 PM in the Pacific Time Zone.**
- **The guided projects are due on Sunday at 11:59 PM in the Pacific Time Zone.**
- **The final project will be published in the last week and is due on October 24 at 11:59 PM in the Pacific Time Zone.**

The following table links the learning objectives of this class with the assignments and shows the maximum number of points that you can achieve with each assignment towards the final grade.

Learning Objective	Assignment	Max. Points
Understand the conceptual and technological fundamentals of dashboards	Tableau quizzes	30
Analyze and understand the persuasiveness and evidence of dashboards	Guided project	30
Implement persuasive and evidence-based dashboards	Final Project	40
Total		**100**

The final grade distribution is as follows.

Points	Letter Grade
100-94	A
>94-90	A-
>90-87	B+
>87-84	B
>84-80	B-
>80-77	C+
>77-74	C
>74-70	C-
>70-0	F

My grading criteria are as follows:

- **A grades** (4.0) reflect work that meets all assignment objectives at the highest possible level and sometimes goes beyond that. The submitted work is of superior quality and could be presented to the target audience with no or minimal revisions. Typically, no more than 40% of participants in a course receive an A grade.
- **B grades** (3.0) reflect work that meets all assignment objectives at a level that is above average but not exceptional. The submitted work shows high levels of competency and could be presented to the target audience with some editing.
- **C grades** (2.0) reflect work that meets all course objectives at an average level but is not exceeding expected standards. The submitted work lacks a clear, in-depth understanding of the subject and could be presented to the target audience only with extensive editing. Typically, at least 5% of participants in a course receive a C grade.
- **F grades (0.0)** reflect work that does not meet course objectives and is below minimum standards. Submissions are late without prior consultation with the instructor, miss the assignment objectives, or show a clear lack of learning progress. Also, repeated violations of the academic integrity standards result in an overall F grade.

I reserve the right to change the grading to accommodate special circumstances and opportunities. Any changes, however, will be discussed and announced in class and on Camino.

Tableau quizzes (Individual assignment)

During the first three weeks, you will answer questions on data visualization with Tableau. The purpose of the quizzes is to assess your understanding of the conceptual and technological fundamentals of dashboards.

- Each quiz will randomly draw **10 questions** from a set of questions.
- **You have 30 minutes to answer the questions**, which means that, on average, you have 3 minutes per question.
- Each question will have three answer options. **The correct answer gives 1 point.**
- Quizzes will become progressively harder each week.
- At the end of each Monday session, we will discuss three practice questions.

Quizzes will be published each week on Tuesdays and are due on the next **Sunday, 11:59 PM**. Quizzes will be about applying Tableau to real-world problems.

Prepare for quizzes by watching the training videos offered by Tableau (https://www.tableau.com/learn/training). **The video sections show the total runtime, so plan accordingly.**

The following table provides an overview of the deadlines for the Tableau quizzes.

Quiz	Due	Max. Points	Relevant video sections
TQ1	09/29 (11:59 PM)	10	Getting Started (34 min), Tableau Prep (67 min), Connecting to Data (62 min)
TQ2	10/06 (11:59 PM)	10	How To (39 min), Visual Analytics (142 min), Why is Tableau Doing That? (28 min)
TQ3	10/13 (11:59 PM)	10	Dashboards and Stories (40 min), Mapping (44 min), Calculations (65 min)
Total		**30**	

Guided project (Individual assignment)

Your objective is to analyze and understand the persuasiveness and evidence of dashboards by developing a closely guided dashboard project.

The topic for the guided project is **climate change**, and the overall goal is to develop a dashboard that describes the current state of climate change. You will complete the guided project in three sprints:

- GP1 - Data cleaning, exploration, and basic analytics
- GP2 - Advanced analytics
- GP3 - Dashboard design

The following table provides an overview of the deliverables for the individual project.

Project Phase	Due	Max. Points
GP1	10/06 (11:59 PM)	10
GP2	10/13 (11:59 PM)	10
GP3	10/20 (11:59 PM)	10
Total		**30**

PLEASE NOTE: You need to start early and discuss intermediate results with me. I will **not** accept late submissions without prior notice or a doctor's note. I am aware that sometimes life goes crazy but please notify me in advance, and we will work it out.

GP1 Data cleaning, exploration, and basic analytics

During this sprint, you will get familiar with the datasets and develop your first analyses.

- Your objective is to clean and prepare the data for using Tableau Prep.
- You will submit a flow file that contains your prep flow and a hyper file that contains your prepared data.
- You will submit a link to your Tableau Public project.
- Additionally, you will answer a quiz about the data. The quiz represents the questions that your audience will ask about your work.
- This assignment will be published on 9/30 and is due on 10/06.

Advanced analytics

The first version of your dashboard should visualize **three** aspects of climate change in an **interesting**, **non-trivial**, and **somewhat unexpected** fashion.

- Your objective is to develop three distinct analyses of climate change data that rely on advanced analytical capabilities of Tableau.
- You will submit a link to your Tableau Public project.
- Additionally, you will answer a quiz about the data. The quiz represents the questions that your audience will ask about your work.
- This assignment will be published on 10/07 and is due on 10/13.

Dashboard design

This version of your dashboard should communicate your insights in a more persuasive manner.

- Your objective is to extend your analyses and restructure your dashboard to make more persuasive arguments.
- You will submit a link to your Tableau Public project.
- Additionally, you will answer a quiz about the data. The quiz represents the questions that your audience will ask about your work.
- This assignment will be published on 10/14 and is due on 10/20.

Final Project (Team assignment)

The objective of the final project is to develop a dashboard collaboratively. Your dashboard should make a complex data-driven argument using several logically connected data visualizations. You will work teams of **up to five** students.

The challenge of a final project is to work quickly as a team organize your team, hold one another accountable, and complement your skills and interests. At part of the team project, **your teammates will evaluate your contributions to the project**. This evaluation may influence your grade for the team project.

- The topic for the final project will be published on 10/21.
- The project is due on 10/24 (**FRIDAY**).
- You will submit your flow file and the hyper file.
- You will submit a link to your Tableau Public project.
- Additionally, you will answer a quiz about the data. The quiz represents the questions that your audience will ask about your work.

How to get an A in this course

I firmly believe that the mastery of data visualization requires constant practice. You will ace this course if you:

- Adhere to the academic integrity standards outlined below.
- Participate in the class discussions, ask questions, and share experiences.
- Support your teammates.
- **Show intermediate results early and often.**
- Start early on the assignments, **seek continuous feedback from me and other sources**.
- Continuously think about **why** you are doing something in your assignments, which is far more important than **what** you are doing.
- Answer the **'boss question'** before submitting **any** deliverable: Would you be comfortable to send your submission **as is** to your boss or a recruiter? If your answer is yes, please submit. If your answer is no, revise before you submit.

Academic Integrity

The Academic Integrity pledge is an expression of the University's commitment to fostering an understanding of and commitment to a culture of integrity at Santa Clara University. The Academic Integrity pledge, which applies to all students, states:

> *"I am committed to being a person of integrity. I pledge, as a member of the Santa Clara University community, to abide by and uphold the standards of academic integrity contained in the Student Conduct Code."*

You are expected to uphold the principles of this pledge for all work in this class. For more information about Santa Clara University's academic integrity pledge and resources about ensuring academic integrity in your work, see www.scu.edu/academic-integrity.

In particular, I expect that you give credit to any material (including but not limited to journal articles, web article, blog posts, images, data sets, and any media) that you have used for completing any assignment in this class. Being able to give credit by referencing sources consistently and correctly is evidence of mastery of a topic. It shows that you can construct original arguments that are backed with verifiable evidence. Failing to give credit is a sign of inadequate learning progress. It shows that you have not understood the topic well enough to formulate your arguments in relation to already existing ideas.

During your work in this class, you will use, modify, or extend digital content that you have found online. You will also use libraries, APIs, code snippets, and data sets that have been created by others. In every piece of work (presentations, assignments, etc.), you must acknowledge work, source code, data sets, and any other content that was not produced by you. Acknowledgments must be easily identifiable, inseparable from your content, and must not violate licenses.

Failure to provide appropriate acknowledgments will result in an F grade for that assignment. Repeated failure to provide appropriate acknowledgments will result in an F grade for the entire course.

During the first class, we will discuss this digital content policy. After this class, I will strictly enforce this policy. If you have doubts, contact me.

Course Conduct

My responsibility

I will support you in your learning in this class and beyond to the best of my abilities. If I am not able to help you myself, I will identify someone who can. I will evaluate your contribution solely based on the standards set by this syllabus. Changes to the syllabus will be highlighted, discussed during class sessions, and will be published on Camino.

Your responsibility

By enrolling in this class, you agree to the requirements stated in this syllabus. You will operate with integrity in your dealings with me and your fellow students. You will engage the learning materials with appropriate attention and dedication and maintain their engagement when challenged by difficult learning activities. You will contribute to the learning of others, and you will perform to standards set by this syllabus.

Mutual respect is the foundation of this course. No one will be criticized for being wrong. Appropriate conduct includes honesty, self-respect, respect for others, and compliance with university policies and standards. Computers in the classroom should be used only for completing course-related work and for taking notes; cell phones must be turned off or muted.

Attendance Policy

Please let me know via email during the first two weeks of the course if you have any conflicts between a course element (class meeting, assignment) and another vital commitment (another course, work, university-related extracurricular activities, religious commitments). At my discretion, I will you provide with alternative means to complete the course element.

I am aware that many of you have multiple commitments. You should attend at least 80 percent of all scheduled class meetings. If you miss more than 20 percent of scheduled classes, you will receive a reduction by one letter grade.

University Policies

Disability Resources

If you have a disability for which accommodations may be required in this class, please contact Disabilities Resources (Benson Hall 216, 408-554-4109) as soon as possible to discuss your needs and register for accommodations with the University. If you have medical needs related to pregnancy, you may also be eligible for accommodations. If you have already arranged accommodations through Disabilities Resources, please discuss them with me during my office hours as soon as possible.

While I am happy to assist you, I am unable to provide accommodations until I have received verification from Disabilities Resources. If you are in doubt of whether you are eligible for accommodations, I encourage you to contact Disabilities Resources (Benson Hall 216, 408-554-4109). The Disabilities Resources office would be grateful for a notice in advance of at least two weeks.

Accommodations for Pregnancy and Parenting

In alignment with Title IX of the Education Amendments of 1972, and with the California Education Code, Section 66281.7, Santa Clara University provides reasonable accommodations to students who are pregnant, have recently experienced childbirth, and/or have medical needs related to childbirth. Pregnant and parenting students can often arrange accommodations by working directly with their instructors, supervisors, or departments. Alternatively, a pregnant or parenting student experiencing related medical conditions may request accommodations through Disabilities Resources (Benson Hall 216, 408-554-4109).

Discrimination and Sexual Misconduct (Title IX)

Santa Clara University upholds a zero-tolerance policy for discrimination, harassment, and sexual misconduct. If you (or someone you know) have experienced discrimination or harassment, including sexual assault, domestic/dating violence, or stalking, I encourage you to tell someone promptly. For more information, please consult the University's Gender-Based Discrimination and Sexual Misconduct Policy at http://bit.ly/2ce1hBb or contact the University's EEO and Title IX Coordinator, Belinda Guthrie, at 408-554-3043, bguthrie@scu.edu. Reports may be submitted online through https://www.scu.edu/osl/report/ or anonymously through Ethicspoint https://www.scu.edu/hr/quick-links/ethicspoint/.