University of New Brunswick

FACULTY OF MANAGEMENT

Academic Year: **2023 – 2024**

COURE OUTLINE
MBA 6108: DATA VISUALIZATION

Instructor:	Kendra Haines	**Term:**	Fall 2023
Office:	TBA	**Day(s):**	Monday
E-mail:	khaines@unb.ca	**Time:**	7:00-9:50 pm
Office hours:	After or before class or MS Teams by appointment	**Classroom:**	SH161

WELCOME. With data's increasing importance to the world of business, business analytics skills combined with the ability to communicate actionable data insights persuasively is key to tackling practical business issues. You have chosen a course in which you will **learn to explore and visually present insights from large data sets in a convincing manner**.

You will do so by learning the fundamentals of **graphic design,** applying it to the visualization of data through graphs, charts, maps, and infographics. You will be introduced to **Tableau a leading data visualization tool** aimed at non-technical users that will enable you to explore, understand, predict, and present complex data in a very fast and effective way. You will become adept at creating persuasive infographics that convincingly present your 'data story'.

This is a fascinating course because it integrates science (data analytics) and art (visuals and infographics) in solving business problems. This is a hands-on course for which you will **need to have a laptop:** get ready for action!

Take the time to read this course outline and please contact me if you have any questions. I'll do my best to respond as quickly as I can. I look forward to you attending this exciting course.

A. COURSE DESCRIPTION

This course introduces you to the principles of graphic design and the study of data visualization through hands-on projects. It is designed with Business students in mind for whom Business Analytics is increasingly becoming an important skill. Data exploration and presentation are key components within that skillset and the focus of this course. Although the course includes learning how to use BI Tools (Tableau) it is in essence a non-technical, critical thinking course aimed at non-technical users focused on visualization. After completion of this course, those students that have developed a more technical interest can pursue more technical courses with Computer Science or with Geodesy and Geomatics in Engineering. Those that are interested more in the business analysis side can pursue further courses with statistics, operations management, or the more analytical offerings within the different fields of business

Pre-Requisite(s): There are no prerequisites for the class and the class is open to graduate students as well as advanced undergraduates (by permission of instructor).

B. COURSE OBJECTIVES

At the end of the course you will be able to:

- Provide an overview and brief **history of the field of data visualization**
- Apply the key **graphic design principles for** visualizing data
- **Critically think** about data visualizations and improve them
- Create data visualizations using **Tableau software**
- **Ask the right questions about exploring data sets, select appropriate ones, create functional vizzes for particular audiences, and present them convincingly** all on a variety of topics.

Target audience

The course is targeted at various student audiences, namely at those who:

- Seek to develop Business Analytics skills.
- Wish to gain skills in using Tableau, a leading Data Visualization tool.
- Are interested in visual design and presentation of information.

C. Assurance of Learning

Our Faculty is accredited by AACSB. This implies that we use a framework for the assurance of learning. When you graduate from our MBA program, we will ensure you master a set of key objectives. These are assessed through the Iliad assessment (soft skills) and the Business Knowledge and Application Test (B-KAT). The test results serve as an input to evaluate and improve the program. Your assistance with this process will help us continuously close the loop and further enhance the quality of the program.

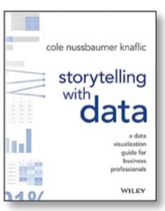
This course relates primarily to the goals about Critical and Creative Thinking, and to a lesser degree to Analysis and Problem-Solving and Systems Capabilities. These issues are addressed in four ways. By the conclusion of the course, candidates are expected to be able to:

- Critique and redesign infographics
- Ask the right questions through an iterative exploratory design process
- Reveal insights hidden in data sets
- Visually present data insights in a persuasive manner

D. COURSE MATERIALS

REQUIRED

Storytelling with Data (Cole Knaflic)



Knaflic, C. N. (2015). Storytelling with data : a data visualization guide for business professionals. Wiley. Copies of the text will be available at the UNB Bookstore. You can also purchase the book from Amazon or borrow it from the Harriet Irving Library as an eBook.

Selected readings (i.e. chapters from other books) will be made available through the Course Reserves system of the Harriet Irving Library and/or posted in D2L.

Tableau

You will be using Tableau in order to explore large data sets and create visualizations.

Tableau

As a student in the course, you will receive a student license valid for the duration of the course.
<u>Please do not pre-install Tableau as this has caused problems getting you the full-year student license</u><u>.</u>
<u>We will install in–class together.</u> **<u>Download the install package before arriving in class and install the program</u>**

Windows

- Microsoft Windows 8/8.1, Windows 10 (x64), Windows 11
- 2 GB memory
- 1.5 GB minimum free disk space
- CPUs must support SSE4.2 and POPCNT instruction sets

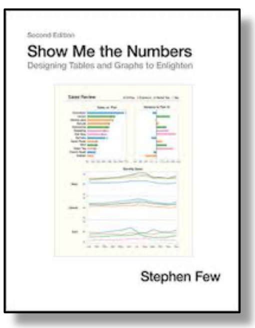
Mac

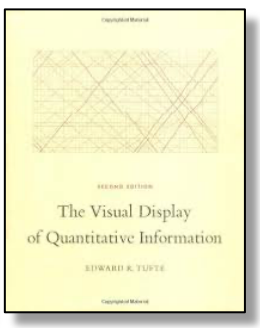
- macOS Catalina 10.15, macOS Big Sur 11.4+, macOS Monterey 12.6+ (for Tableau 2022.3+), and macOS Ventura (for Tableau 2022.3+)
- Intel processors or Apple Silicon processors (using Rosetta)
- 1.5 GB minimum free disk space

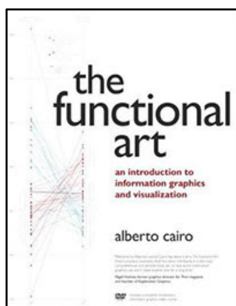
It is the students responsibility to have access to required technology (hardware).

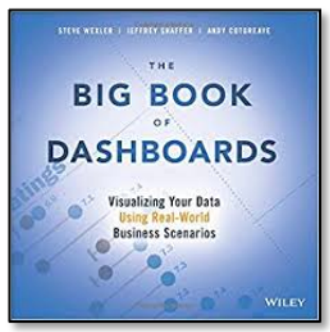
OPTIONAL

The following books would be valuable additions to your library if you are interested in data visualization:









Few, S. (2004). Show Me the Numbers: Designing Tables and Graphs to Enlighten, Analytics Press (2004)

Tufte, E. (2001) The Visual Display of Quantitative Information, Graphics Press, 2nd Edition.

Cairo, A. (2012). The functional art: an introduction to information graphics and visualization, New Riders.

Wexler, S. and Shaffer, J. (2016). The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios, Wiley.

E. EVALUATION COMPONENTS AND WEIGHTS

i. Components

Individual	1: Trick-or-Treater data viz	**10%**
	2. Data Viz Critique	**10%**
	3. Data Viz Critique & Redesign	**10%**
	4a. Analytics Pitches (2 min)	**10%**
Team	4b. Analytics Presentation (10 min)	**15%**
	5a. Data Challenge Infographic	**10%**
	5b. Data Challenge presentation	**15%**
	6. Dashboard competition with JDI	**20%**

There are several expectations that you should meet. These are the generic grading criteria I will be using for the projects, in addition to a detailed rubric:

- Every project must be completed on time. Late work will not be accepted.
- Assignments should demonstrate a deep dive into the data to provide an actionable insight
- Spatial organization, structure of the elements, informative value of the display
- Thoughtful use of colour
- Thoughtful choice of type
- Aesthetic design choices in general
- Creativity
- Application of the Principles of Analytical Design and Graphical Excellence

Group work

You will partake in group work in this course. Groups may split apart up to FIVE days before a due date without reason so long as all group members and the instructors have been notified. In that case everyone is still individually responsible for completing the work by the delivery date whether alone or with others.

ii. Grade Determination

At the end of the course your overall percentage grade will be converted to your letter grade in accordance with the following conversion scheme. The instructor retains discretion to adjust final grades by as much as 3% on the basis of rounding of conversions for cumulative scores for the course.

Letter	Percent	Letter	Percent
A+	>95	B-	70 - 74
A	90 - 95	C+	65 - 69
A-	85 - 89	C	60 - 64
B+	80 - 84	D	55 - 59
B	75 - 79	F	< 55

Please Note:

i. Grades will not be rounded up to the next letter.
ii. A grade of B- or higher is required for degree credit in the MBA program. For students enrolled in other Masters programs, please consult your faculty graduate student handbook.
iii. The D2L Grading System is not the official grade sheet. The overall grade reflected in D2L may not be the same as the grade calculated at the end of the course based on the weighting of assignments.

F. COURSE UNDERSTANDINGS

i. Classroom Approach

- This course will be delivered as an on-campus face-to-face course. We will use the D2L system for content organization and submission of assignments.
- Ensure you are present and available during class time. Class lectures will not be recorded. It is incumbent on the student to ensure they are available to attend class at the posted class time.
- This course has a heavy workload. You may need up to 10 hours (or more) of out-of-class time a week to complete course requirements.
- Please turn off electronic devices such as cell phones, pagers, or laptops for the duration of a class, unless we indicate otherwise.
- Please bring a laptop to class as you will often be working on it during class time.

ii. Attendance and Conduct

- Students are expected to attend all classes, or other class meetings officially designated for a particular course. They are expected to complete all assignments. Due to the dynamics of the course your attendance, participation and punctuality are critical to your successful completion of the class. You must be on time—and prepared—with no exceptions.

- Three unexcused absences (equivalent to 9 hours of class time = 30% of the course) will result in the awarding of a grade of F. What is an excused absence?
    - **COVID-19**: All COVID related absences (positive test or symptomatic). If you are experiencing 2 or more COVID 19 symptoms stay home and please let me know as soon as possible
    - **Major Illness**: Only excused with legible, signed and dated note from a licensed health-care provider. Get better soon.
    - **Death** in the immediate Family.
    - **Appointments with doctors, dentists, parole officers etc**. Please schedule these as to not interfere with your attendance, however, this is not always possible.
    - **Commitments to work**: not excused, except for in extraordinary circumstances please plan accordingly.
    - **Military Service**: Excused, and thank you for your service.
    - **Student Athletes**: Only officially sanctioned absences will be accepted. Must be notified ahead of time by coach or athletics director.
    - **Parenting**: All parenting-related absences are acceptable, however, please do your best to attend class. Prior notice appreciated when possible.

- It is the students responsibility to check in with a classmate to obtain course notes
- Deliverables are still due according to the course schedule.

NOTE: If a student has not attended class prior to September - 15th, 2023 they will be removed from the class. Unauthorized candidates will not be graded.

iii. Written Deliverables.

We know you are well on your way to becoming a business professional and therefore we expect:

- Course materials and note preparation must be completed prior to the designated sessions as we will be discussing the results in class.
- Completed assignments are professionally written and are referenced using APA (7th) style.

IV. Submission of assignmenst and deliverables

Students must submit all required assignments and supporting work via D2L. The submission time listed in D2L will be used to determine whether an assignment is on time or late. If multiple submissions are received, the final submission will be considered for grading (along with determining if the assignment was submitted on time). Submissions that are "in progress" or "draft" status in D2L at the designated due date and time will not be considered submitted. For group projects, the designated spokesperson is responsible for submitting all materials on behalf of the group to the appropriate assignment folder. **Late assignments are not accepted. Not having access to interent is not a valid excuse. Assignments that are uploaded as blank files will be graded as a zero. Ensure you submit the assignment in the proper (indicated) file format. If file cannot be opened by the instructor the submission will be considered a zero.**

iv. Missed Tests or Assignments

Because results have been discussed in class, We can unfortunately not accept any late submissions. If you miss any assignments then based on the policies of the Faculty of Management you must submit documentation which substantiates medical or personal problems. If this documentation is provided, an substitute assignment will be offered.

v. Expectations of Students

Students are expected to prepare and participate by:

1. Reading scheduled assignments each week
2. Participating in class discussions and activities
3. Completing the assigned projects by the due date
4. Participate in Group Projects Students are expected to complete each individual project independently.

The student's submissions must represent their own work, and citations must be provided where content from other sources is referenced. Students will self-assign themselves to groups for completing specific assignments. The instructor will be responsible to assign students to groups. It is important that you participate as necessary in the groups to complete assignments. **Low participation in your group may cause the group to go ahead without you, in which case you will still be responsible to complete the asignment.**

vi. Adjustments to assignments, schedule, and syllabus

The scope, timing, and due date/time of any assignments, projects, homework, exams, or any other required work may be adjusted by the instructor as needed to maximize learning opportunities for students and/or better serve the goals of the course. The syllabus may likewise be modified at the discretion of the instructor. Any adjustments will be communicated to students in class, on D2L, and through Email with as much advanced notice as possible.

Snow Days: Should the university be closed to inclement weather or if it is deemed unsafe to travel class will also be canceled and we will adjust the schedule / move content online as self-study.

Other University Closures: If the university is closed due to a power failure, fire, or other hazard we will shift to an online delivery. Please check your email for details should this occur.

Emergency COVID Instructional Shift: Should the need arise that we must shift to fully remote learning we will continue to meet at our scheduled class time in Microsoft Teams. Further details will be provided at the time of remote learning shift.

G. ACADEMIC INTEGRITY AND COPYRIGHT, AND STUDENT HELP

The University of New Brunswick places a high value on academic integrity and has a policy on plagiarism as well as cheating and other academic offences. Plagiarism includes:

1. Quoting verbatim or almost verbatim from any source, including all electronic sources, without acknowledgement.
2. Adopting someone else's line of thought, argument, arrangement, or supporting evidence without acknowledgment.
3. Submitting someone else's work, in whatever form, without acknowledgment.
4. Knowingly representing as one's own work any idea of another.

Examples of other academic offences include:

1. Cheating on exams, tests, assignments, or reports.
2. Impersonating somebody at a test or exam.
3. Obtaining an exam, test or other course materials through theft, bribery, collusion, purchase or other improper manner.
4. Submitting coursework that is identical or substantially similar to work that has been submitted for another course.
5. And more as set out in the academic regulations of the Undergraduate and School of Graduate Studies Calendars.

Penalties for plagiarism and other offences range from a minimum of F (zero) in the assignment, exam or test to suspension or expulsion from the University, plus a notation of the academic offence on the student's transcript.

For more information, please go to the Undergraduate Calendar, Section B, Academic Regulation VIII. Academic Offences or the School of Graduate Studies Calendar, University Regulation 15. It is the student's responsibility to know the regulations.

Unauthorized sharing of class materials, notably to file sharing sites
Generally speaking, instructors at University of New Brunswick (UNB) own the intellectual property of their teaching and research-related materials, including but not limited to: lecture notes, PowerPoint presentations, lab manuals, syllabi, quizzes, tests, exams, and streamed lectures. Classmates are also copyright holders of the materials they create themselves or jointly with others. As a student of this class, you are being provided access to these materials, but you are not being provided permission to copy and share them with others.

Please be aware that sharing of class materials, such as posting files and content to file sharing sites like Chegg and Course Hero, without the instructor's approval as copyright holder (or your classmates if they are the creator or co-creator), infringes on their intellectual property rights. Sharing and posting files and content without the consent of the copyright owner(s) can lead to potential student discipline, up to and including expulsion from UNB (see unauthorized sharing of teaching materials on the Copyright @ UNB website).

Contract cheating exposes you to severe risks including blackmail
You may be offered services by individuals and companies that propose to write custom papers and complete quizzes, tests or entire courses on your behalf. Using such contract cheating services are a clear violation of academic integrity and can lead to your expulsion from UNB and the revoking of your degree. You are also making yourself vulnerable to blackmail by these contract cheating companies both during and after the completion of your studies.

Seek help through UNB's Student Services when you are struggling with your studies
UNB offers many services to help you when you are struggling with your courses. Please contact the relevant service at UNB's Student Services when you are faced with difficulties.

Use of Generative AI such as ChatGPT
In this course there may be assignments where you make use of generative AI, such as ChatGPT, and those where you may not use it. When generative AI is permitted you must indicate that Generative AI was used. If the assignment explicitly states that no generative AI is to be used, then failure to abide by this stipulation will be treated as plagiarism.

On mimicking versus copying
Note that according to Alberto Cairo, "Mimicking someone else's style is not plagiarism. Actually, this could be a good strategy for a beginner. Why not emulate John Grimwade, Moritz Stefaner, The New York Times graphics desk, or Hans Rosling at first and, after a few years, start moving away from their style? But copying someone else's projects, charts, maps, drawings without proper permission is plagiarism for sure.

I. Steps to Take When You Have Technical Questions

When learning any new software package, you are bound to have technical questions. Investigating and solving these questions is an important part of learning the software. When you have a question about Tableau that you cannot answer on your own, you should follow the following steps:

1. Check the course discussion board to see if this question has already been resolved by your classmates
2. If you did not find the solution in Step 1, consult Tableau's extensive online resources and training videos: a. http://onlinehelp.tableau.com/current/pro/online/windows/en-us/help.htm b. http://www.tableau.com/support/manuals/quickstart c. http://www.tableau.com/learn/training

a. If you did not find the solution in Step 2, check Tableau's community discussion forum to see if the solution has been posted there. If your question has never been posted on the forum, then post it yourself and see if you get a response.
   a. Home page: https://community.tableau.com/welcome
   b. Beginner: https://community.tableau.com/groups/newbie-tableau-desktop
   c. Advanced:https://community.tableau.com/community/viz-talk/tableau-community-library/calculation-reference-library
   d. Tips for an effective post: https://community.tableau.com/docs/DOC-5471

3. If you did not find the solution in Step 3, ask a classmate for help

4. If you did not find the solution in Step 4, ask your instructor or teaching assistant for help
5. Post the question that you encountered, along with the solution you found, on the course discussion board. Following the above steps will help you develop the ability to research and answer Tableau questions autonomously, while also fostering collaboration among your peers to find and share solutions. These skills will serve you well as you continue to use Tableau after this class is completed.

I. Internet and Email Access

Students are expected to have dependable access to Internet and email. All students are required to use their assigned UNB email address for all communication. This includes sending and receiving from that address. This email must be checked regularly for communication from the institution and from instructors.

J. Technical issues It is your responsibility to procured reliable, readily accessible Internet service and reliable computer in order to fulfill course expectations. Your instructor is under no obligation to accept late assignments or waive required tasks (e.g. discussion participation) due to lack of online access or malfunctioning computer hardware or software. Please consider identifying an alternative Internet source in case of technical problems.

In short, technology issues are not an excuse for missing any course expectations (assignments, presentations, course work to prepare for class). It is your responsibility to ensure your computer is configured correctly, have the appropriate software, reliable internet service, and that you address issues well in advance of deadlines.

H. COURSE SCHEDULE

Sep 11

Welcome to the Course
Why data visualization matters, overview and history, some examples

- Knaflic, C. N. (2015). Chapter 1: The Importance of Context.

Data Visualization: Fundamental Principles
Critical thinking & core principles

- Tufte, E. (2006). "The Fundamental Principles of Analytic Design", Beautiful Evidence.
- Few, S. (2011). Teradata, David McCandless, and yet another detour for analytics

Sep 18

Tableau Bootcamp: Introduction to Tableau
Bring laptop to class – we will register Tableau in class (download and install the software in advance)

Intro to the Data Visualization Challenge (Project 5a and 5b)
In teams (3 students max per team) explore a data set and provide an insightful visualization

Sep 25

Data Visualization: Fundamental Principles: Review

Choosing appropriate Charts
How to choose the right chart

- Knaflic, C. N. (2015). Chapter 2: Choosing an Effective Visual.
- Few, Stephen (2005). "Effectively Communicating Numbers: Selecting the Best Means and Manner of Display" ProClarity

Project 1: Trick-or-Treater data viz: DUE SEPTEMBER 25, 2023 @ 23:59 AST

Oct 2

Graphic Design Principles
Decluttering, Type, Color, Unity, Variety, Hierarchy, Style guides.
The good, the bad, and the ugly.

- Knaflic, C. N. (2015). Ch. 3: Clutter is your Enemy. & Ch. 4: Focus Your Audience's Attention.

Browse:

- The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures Dona M. Wong, W. W. Norton & Company (2010). Chapter 1.
- Bolton, P. (2014). Parliament Chart Format Guide, White paper, House of Commons Library

Project 2: Data Viz Critiques: DUE OCTOBER 2, 2023 @ 23:59 AST

Oct 9	**No Class: Thanksgiving**
Oct 16	**Storytelling with Data** Explaining Data for Business Decisions • Knaflic, C. N. (2015). Chapter 8: Pulling it all Together. **Project 4a: Analytics Project Pitches (2 minutes) & Team Formation DUE OCTOBER 16, 2023 @18:00 (upload your power point presentation to D2L BEFORE class) [we will start with presentations]**
Oct 23	**Infographics** **Using Maps & Likert Surveys** **Project 3: Data Viz Critiques & Redesign DUE OCTOBER 23, 2023 @ 23:59 AST**
Oct 30	**Project 4b: Analytics Project Presentation (team) – 10 min DUE OCTOBER 30, 2023 @18:00 AST** **Project 5a: Infographic DUE NOVEMBER 3, 2023 @ 23:59 AST**
Nov 6	**NO CLASS – READING WEEK**
Nov 13	**Visualization Wheel** How to balance art and functionality Browse: • The Art of Data Visualization | Off Book | PBS Digital Studios [https://youtu.be/AdSZJzb-aX8?si=2Ev8hQ1BXopknEq2] Team time (2nd half of class) – Project 5a Infographic Touch-Up *****Your Final Infographic MUST be submitted to IBEC for the Data Visualization Challenge by midnight on NOVEMBER 15, 2023.**

Nov 20

Project 5b: Data Visualization Challenge (In-Class): 4 min + 5min Q&A
UPLOAD PRESENTATION BY 18:00 AST NOVEMBER 20, 2023
Provide the perfect insight in the perfect form.

Nov 24

Data Visualization Challenge @ WU Centre: More details to come; please ensure you are available for the day. Inform your other instructors you are participating in an experiential learning event.

Nov 27

Dashboard Design
How to design dashboards that facilitate decision making

Browse:

- Wexler, S., Shaffer, J., & Cotgreave, A. (2017). The big book of dashboards : visualizing your data using real-world business scenarios. Wiley (available through the HIL as an eBook)
- The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios [https://youtu.be/PNxOCDtq4Aw?si=ODQ41Fv-ns64kcd]

Team time (2nd half of class) – work on your dashboard

Dec 6

Project 6: Dashboard Design Presentations @ Data Visualization Centre HIL (3rd Floor)
Upload your final dashboard (Tableau .twbx file), presentation (ppt) and all references by 18:00 AST DECEMBER 6, 2023

No final exam

APPENDIX 1: ASSIGNMENTS & PROJECTS

Data visualization is a skill that is best developed and evaluated through practice. Hence, there is no final exam in this course. Instead, you will be exploring and explaining data through six different projects.

Project 1: Trick-or-Treater data viz
You will create an infographic using a simple data set provided by Jeffrey Shaffer, who has posted the instructions for this assignment and data set on his blog "Data + Science" at:
http://www.dataplusscience.com/HalloweenData.html

Project 2: Data Viz Critique
You will engage in critical thinking about infographics and data visualizations by reflecting on existing visualizations. Select a good and a bad information graphic, of which there is no on-line discussion of its qualities, and in **max 500 words** for each describe what you think is good and/or bad about the graphic. Make sure to include a screenshot of the graphic (credited) and a link to the viz. *Please email me with your choice before beginning this assignment: First-come, first-served. The infographic must not already have a critique online and must come from a reputable source.*

Project 3: Data Viz: Critique & Redesign
This time you will use your critical thinking about information graphics to improve an existing data visualization. Select an infographic that makes use of a database that you also can access and that you believe is flawed or fall short of its potential. Make sure to include a screenshot of the graphic (credited) and a link to the viz. Critique the data visualization in **max 500** words and then **redesign** it using the same data set. The Redesigned Data Viz should consist of (1) a sketch drawing using a pen or pencil, (2) a digital Data Viz using Excel or Tableau to manipulate the data and whatever other software to finish the infographic, such as PowerPoint.

Project 4a: Analytics Project Individual Pitch (2 min)
This project is of your choosing. You can either use an existing open data set, or use a data set from a local organization, may even be your own employer. Create an insightful viz using this data set and pitch I to the class. Your pitch will be peer evaluated and the top 33% chosen to form teams of 3 students each for the final project.

Project 4b: Analytics final project (Team)
This final project is based around one of the top 33% of individual pitches in project 4a. You will have 10 minutes tell a story around insights into the data set you investigated. Teams of up to 3.

Project 5a & b: Data Visualization Challenge & Infographic
You will be put in teams of two to maximum three students. At the start of the Challenge each team will receive the same data set. Your goal is to create the most insightful viz presentation from the data set and present actionable insights through a data story. You will also create an infographic (poster) providing actionable insights from your presentation. You will submit to the Data Visualization Challenge hosted by our Faculty (IBEC) in Fredericton. NOTE: Infographics are due into IBEC November 15, 2023. Data visualization challenge will be November 24, 2023. Plan accordingly.

Project 6: Dashboard design

You will explore a dataset. Then you will present the key insights in the form of a Dashboard Design at UNB's Data Visualization Lab in the Research Commons in the Harriet Irving library. Further details to come. Note: we may be presenting with the other section on December 6, 2023. I will confirm the plans as soon as possible.