Carleton University

Sprott School of Business | AACSB

EMBA/ITIS 5434: Data Visualization for Analytics

Course Syllabus

1. General Course Information

Course Title: Data Visualization for Analytics

Credit Weight: 0.25 credits

Prerequisites: ITIS 5431

Instructor: Robert Riordan

Title: Contract Instructor
Phone:
Email: robertriordan@cunet.carleton.ca

2. Course Description

Principles, techniques, technology and applications of data visualization for decision making; cognition and visual perception; types of visual analysis; interactive dashboards; story telling; infographics.

Includes: Experiential Learning Activity

3. Course Rationale

Introduces several modalities of visual communication of data for maximal effect. Emphasized careful design with emphasis on simplicity. Several visualization tools are considered, but this is not a tools course. Students are expected to either bring or develop mastery of at least one tool. Very hands on.

4. Course Learning Objectives

After successfully completing this course, you will be able to:

LO1. Identify data types and measurement levels of dataset variables;

LO2. Explain key design principles associated with data visualization;

LO3. Apply basic features of data visualization software;

LO4. Perform visual data discovery tasks including selecting appropriate chart types and representations, and identifying trends and distributions;

LO5. Perform visual data deployment tasks including identification and use of pre-attentive attributes, and designing and implementing dashboards;

LO6. Use visual representations of data as a basis for effectively communicating key insights;

LO7. Apply storytelling techniques to discover The Big Idea in a dataset;

LO8. Apply Storyboarding in planning visualizations;

5. Course Modality: Asynchronous

This is a fully online course where instructors and students share information, ideas, and learning experiences in a virtual course space. Asynchronous courses do not require participation in scheduled meetings. However, students are expected to remain up to date with the deadlines and due dates provided by the instructor. This course requires high-speed Internet access and a computer with Microsoft 365 installed (see below).

Technical Skills:

Minimum technical skills for the course:

- Essential Technological Skills for Students include but are not limited to:
    - Knowledge of how to transfer and share files
    - Understanding of digital storage software
    - Digital presentation skills
    - Word processing skills
    - Electronic spreadsheet (i.e. Excel, Google Sheets) skills
- Tips for Learning in an Online Environment
    - Preparing to learn in an online environment
    - Recommended technical requirements

Please note that all Carleton students receive free access to Microsoft 365 / Office.

- Get Microsoft Office for Students

6. Student Support

Academic Support

The Centre for Student Academic Support (CSAS) is a collection of student support services designed to help you achieve your goals and improve your learning.

- CSAS can help you with academic reading, academic writing, critical thinking, time management, and more.
- For complete information on their workshops and other services, please visit the Centre for Student Academic Support.

Technical Support

A variety of technical support options are available to students on our Brightspace Student Support page through documentation and videos, including information on:

- How to use Brightspace
- Communication and collaboration

- Assessments

Students can access support by phone, chat or email by contacting the D2L Brightspace Service Desk.

Health and Wellness Support Services

Carleton offers a wide range of Student Support Services, including resources for mental health, healthy living, getting active, and getting support. For complete information on resources, please visit: Carleton Wellness Resources: Supporting Your Mental Health.

7. Course Schedule

Please regularly check and log into Brightspace to review new content. Configure your personal notifications to opt into course announcements so that they will be emailed to your Carleton email address.

Discussions are open for the module week beginning Monday at 12:01 AM and closing Sunday at 11:59 PM. Comments are required to be posted by Thursday at 11:59 PM and dialogue/comments on the posts of a peer are open until Sunday at 11:59 PM.

Online quizzes are open during the module week from Monday at 12:01 AM to Sunday 12:59 PM.

Module	Topics	Materials	Deliverable
1	1) Intro to data types and measurement 2) Distinguish between data and information 3) Description of grades dataset 4) The data to knowledge continuum	1) Textbook Chapter 1 2) Module 1 lecture videos 3) The beauty of data visualization (YouTube) 4) Understanding Data Types and Structures , (YouTube) 5) Crafting Stories with Data (YouTube) 6) The Recipe for Powerful Data Visualization | Google Data Analytics Certificate (YouTube)	Discussion #1 - Was the Lauren Harris painting, shown in the Module 1 lecture slides, an example of data, information, neither or both? Discussion #2 - Was storyboarding, which was introduced in Chapter 1 of Knaflic, useful in crafting your 3-minute story from the data? Why or why not? Be specific. Discussion #3 - Was the big idea tool, which was carefully outlined in Chapter 1 of Knaflic,

Module	Topics	Materials	Deliverable
			useful in crafting your 3-minute story from the data? Why or why not? Be specific. Online quiz
2	1) Getting and maintaining attention. 2) Memory modules. 3) Kahneman's systems. 4) Introduce The Big Idea, brainstorming and storyboarding. 4) Visual perception.	1) Textbook Chapter 2 2) Module 2 lecture videos 3) The Science of Thinking (YouTube,) 4) Thinking Fast and Slow by Daniel Kahneman: Animated Summary with Focus on System 1 and 2 (YouTube) 5) How your "working memory" makes sense of the world (YouTube) 6) What are the principles of Visual Perception? Intro to Design (YouTube) 7) Basic Compositional Theory | Basics for Beginners (YouTube)	Discussion #1 - Provide two examples of Gestalt principles in everyday advertising. Explain the use. Discussion #2 - Discuss whether a stop sign is an example of preattentive processing (PP). Support your answer. Specify and discuss two more examples of PP from everyday use. Online quiz Three sketches/mockups with a short explanatory narrative of appropriate graph types to visualize data in the grades dataset. Due May 14 @ 11:59PM.
3	1) Storytelling 2) Storyboarding 3) Using Excel to create basic visualizations 4) Introduction to the wide variety of available chart types	1) Textbook Chapter 3 2) Module 3 lecture videos 3) Storytelling with data (YouTube)(supplememtary) 4) How to improve your skills in storytelling with data (YouTube) 5) What is the best chart: Selecting among 14 types of charts Part I (YouTube)	Online quiz Discussion #1 - Critique of Canada Population and Reproductive Outcomes visuals Storyboard grades data. Due May 21 @ 11:59PM

Module	Topics	Materials	Deliverable
	5) Become familiar with a data visualization tool	6) What is the best chart: Selecting among 14 types of charts Part II (YouTube) 7) Use sticky notes to improve your next presentation (YouTube) 8) Linegraphs and slopecharts: What you should know (YouTube)	Visualization of grades data using Excel/PowerPoint. Due May 21 @ 11:59PM
4	1) Designing visualizations using colour, font and design principles 2) Focus 3) Preattentive Processing 4) Gestalt 5) Colour Vision Deficiency 6) Introduce City of Ottawa data	1) Textbook Chapter 4, 5 2) Module 4 lecture videos 3) Ten considerations when designing a graph (YouTube) 4) How to use color in your data visualization (YouTube) 5) The importance of contrast when communicating with data (YouTube) 6) The Gestalt Principles | Basics for Beginners (YouTube) 7) Use accessible colors when graphing (YouTube)	Online quiz Discussion #1 - Present and discuss your Big Idea from the City of Ottawa dataset, including the description of charts/graphs you would use to animate your Big Idea. Complete the Big Idea worksheet for the data and produce at least 5 graphs/charts in Excel. Due May 28 @ 12:59PM
5	1) The Golden Ratio in design 2) Declutter 3) Power BI 4) Data models and SQL 5) The Covid data	1) Textbook Chapters 6, 7 2) Module 5 lecture videos 3) How to focus attention in data visualization (YouTube) 4) How to declutter data visualizations (YouTube) 5) The Golden Ratio: Is It Myth or Math? (YouTube) 6) 13 types of Infographics and when to use them (YouTube) 7) How to create animated infographics | Five types of animations for infographics (YouTube)	Online Quiz Discussion #1 - What assumptions are you making as you declutter and focus the existing visualization? Discussion #2 - Is it worthwhile to make our designs pretty? Why or why not? Create focus and declutter an existing visualization. Due June 4 @ 12:59PM

Module	Topics	Materials	Deliverable
		8) Training videos for either Power BI or Tableau	Create infographic from City of Ottawa data with corresponding Big Idea template. Due June 4 @ 12:59PM
6	1) KPIs 2) Presentation vs. Charting vs. Dashboards vs. Infographics 3) Moving from Excel to PowerPoint to enhance graphics	1) Textbook Chapter 8, 9 2) Module 6 lecture videos 3) 12 dashboard design tips for better visualization (YouTube) 4) Actual vs. target chart in Excel (YouTube) 5) 6 things you're doing wrong in PowerPoint (YouTube) 6) Present with CONFIDENCE with THESE 3 PowerPoint tips (YouTube) 7) Quick tips for better virtual presentation and delivery (YouTube)	Online quiz Discussion #1 - Present your KPIs, along with the rationale for each. Craft a dashboard, with interactive elements using the 8 indicators corresponding to the KPIs that you created in the activity. Due June 11 @ 12:59PM
7	1) Final project	1) Textbook Chapter 10	Final Project, Due June 18 @ 12:59PM

8. Learning Materials

Textbook

1) Storytelling with Data: A data visualization guide for business professionals, Cole Nussbaumer Knaflic, John Wiley & Sons, 2015

2) Storytelling with Data: Let's Practice, Cole Nussbaumer Knaflic, John Wiley & Sons, 2020

Other Resources

Tableau, Power BI and Visme (all referenced in lectures and assignments)

9. Grading Scheme

Activity	Scored Out of	Percent of Total Grade	Module
Discussions (10)	4	5	1-6
Module quizzes (6) (Module 1 quiz is pass/fail)	10	5	1-6
Sketch/Mock-up	13	5	2
Visualization of grades data	5	5	3
Big Idea + charts/graphs exercise	10	10	4
Focus/declutter	5	5	5
Infographic	13	20	5
Dashboard	13	15	6
Final project	13	30	7
TOTAL	---	100%	

Grading

The Carleton University grading system will be used to determine your final course grade. Letter grades correspond to the following percentages:

Percentage	Final Grade
90 - 100	A+
85 - 89	A
80 - 84	A–
77 - 79	B+
73 - 76	B
70 - 72	B–
67 - 69	C+
63 - 66	C
60 - 62	C–
57 - 59	D+
53 - 56	C
50 - 52	D–
0 - 49	F

Final grades in this course are determined by the course instructor and must be approved by the Dean. Grades submitted by the instructor are subject to revision and should not be considered final until they have been approved by the Dean.

Please keep in mind that points for individual assessment and thus your final grades are added, rather than deducted – i.e., you all start with 0 and work your way up, rather than starting at 100 and having points reduced from there. A subtle but important point.

Late Assignments

To ensure fairness to all students, penalties will be applied to late assignments: Failure to submit an assignment on time will result in an initial penalty of five (5) percentage points, followed by an additional 10 (!!) percentage points **per day or part thereof**, thereafter. For example, an assignment that would normally merit a grade of 80% would receive a grade of 75% if submitted after the deadline on the due date, 65% if submitted the following day, and so on.

Requests for extension without penalty will be considered in cases of illness, family emergency, or other exceptional circumstances. Documentation may be required.

10. Course Evaluation

At the end of this course, students are encouraged to complete a course evaluation that will be distributed to them via email and through a course link.

11. Contribution to Program Learning Goals

MBA Learning Goal	Covered	Introduced	Taught but not Assessed	Taught and Assessed
MB1 Leadership and Collaboration ***Graduates will be equipped for leadership and collaboration.***	No	No	No	No
MB2 Communication ***Graduates will be effective communicators***	Yes	Yes	Yes	Yes
MB3 Critical Thinking and Problem-Solving ***Graduates will be skilled in critical thinking and problem solving.***	Yes	Yes	No	No
MB4 Functional Knowledge ***Graduates will have knowledge that is relevant to business and be able to apply that knowledge to address business issues, opportunities, and risks.***	Yes	Yes	Yes	No
MB5 Global Awareness ***Graduates will have an appreciation of the global environment of business.***	No	No	No	No
MB6 Ethics and Responsible Management ***Graduates will apply ethical considerations and principles of responsible management in business decision-making.***	No	No	No	No

12. Group Work

No group work in this course.

13. Communication

Brightspace and email are the primary means of communicating with the instructor. See the Student Support Site for more information. Please do not call the instructor's office phone.

To respond to your emails, instructors and administrators need to see your full name and Carleton University ID. For this reason, it is important to send all messages from your Carleton email account. If you do not have or have yet to activate this account, you can do so by visiting the New Students page.

Instructor Response Times

Assignments will be graded with feedback (if needed) within a week. Expect to receive a reply to your question(s) within 24 hours, Monday through Friday, unless otherwise posted by the instructor.

Netiquette (Online Etiquette)

Please use the following rules of netiquette as you post to online discussions and send messages to your instructor and other students in the course:

Use **professional language.** Be positive and constructive in your feedback to replies to students. Be polite by including please and thank you. Use inclusive language and terminology.

Avoid ALL CAPS. This comes across as shouting to the reader. Instead, use **bold** formatting to emphasize words.

Use **proper language and titles** and avoid slang or profanity. Even if a word is one you consider to be "not so bad", it could be offensive to others.

Review posts and messages before saving. Check for grammar and spelling errors and restate your message when necessary.

Ask for clarification. If you do not understand an assignment or feedback from the instructor, please ask for clarification. Instructors do their best to word posts/messages as clearly as possible, but in an online environment they cannot "see" if their messages are being understood.

14. Academic Regulations

University rules regarding registration, withdrawal, appealing marks, and related matters can be found at General Graduate Regulations.

15. Requests for Academic Accommodation

Carleton University is committed to academic accessibility for all individuals. Academic accommodation refers to educational practices, systems, and support mechanisms that accommodate diversity and difference and allow students to perform the essential requirements of their academic programs. The processes for submitting these requests are as follows:

Pregnancy

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please visit the Equity Services website: Student Guide to Academic Accommodation.

Religious Obligations

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, please visit the Equity Services website: Student Guide to Academic Accommodation.

Students with Disabilities

If you have a documented disability that requires academic accommodation in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the due date of the first assignment or exam for which you require accommodation. After requesting accommodation from PMC, be sure to communicate with your instructor to ensure that the necessary accommodation arrangements are in place.

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: Carleton's Sexual Violence Policy.

For more information on academic accommodation, please consult Carleton's Course Outline Information on Academic Accommodation.

16. Academic Integrity

Carleton University's Academic Integrity Policy defines plagiarism as "*presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own."* This includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source.

Plagiarism is a serious offence that cannot be resolved directly by the course instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

Examples of plagiarism include, but are not limited to:

- Any submission prepared in whole or in part by someone else;
- Using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment;
- Using someone else's data or research findings without acknowledgement; Failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

Violations of academic integrity also include:

- Using unauthorized material when completing an assignment or exam,
- Fabricating or misrepresenting research data;
- Unauthorized co-operation or collaboration, and;
- Completing work for another student.

Academic integrity violations constitute a serious academic offence, weaken the quality of the degree, and will not be tolerated. Penalties may include: a failing grade for the submitted work and/or course; academic probation; a refusal of permission to continue or to register in a specific degree program; suspension from full-time studies; suspension from all studies at Carleton, and; expulsion from Carleton.

Students should familiarize themselves with and follow the Carleton University Student Academic Integrity Policy, which is available, along with resources for compliance, at: Student Academic Integrity Policy.

17. Course Copyright

Materials used in this course—including lectures, PowerPoint presentations, discussions, learning activities, posted notes, case studies, assignments, and exams—are copyright protected and remain the intellectual property of their respective author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

Students registered in this course may take notes and make copies of course materials for their own educational use only. Students may not reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

18. Equity and Inclusion

All members of the Carleton University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please visit the website of Carleton's Department of Equity and Inclusive Communities.