



THE UNIVERSITY OF BRITISH COLUMBIA

School of Information
Faculty of Arts

We acknowledge that we are on the traditional, ancestral and unceded territory of the hən̓q̓əmi̓n̓əm̓ speaking Musqueam people.

iSchool Mission: Through innovative research, education and design, our mission is to enhance humanity's capacity to engage information in effective, creative and diverse ways.

ARST 575H / LIBR 514F: Information Visualization and Visual Analytics (3)

Program:	MAS, MLIS, and MASLIS
Year:	2023 Summer Term 1
Course Schedule:	Tuesday and Thursday, 2:00 pm – 4:50 pm
Location:	Terrace Lab
Instructor:	Dr. Richard Arias-Hernandez
Office hours:	On Zoom by email appointment
E-mail address:	richard.arias@ubc.ca
Learning Management Site:	http://lthub.ubc.ca/guides/canvas/

Course Goal: This course provides an overview of the fields of Information Visualization and Visual Analytics. The goal of Information Visualization is to use human perceptual capabilities to gain insights into large and abstract data sets that are difficult to extract using standard query languages. The goal of Visual Analytics is to synthesize information and derive insight from massive, dynamic, ambiguous and often conflicting data; detect the unexpected; provide timely defensible and understandable assessments; and communicate assessment effectively for action. Emphasis in this course will be placed on understanding Information Visualization and using a Visual Analytics tool for knowledge exploration.

Learning Outcomes:

Upon completion of this course students will be able to:

- [LO1] Explain the history and development of the fields of information visualization and visual analytics and appreciate the differences between the two approaches [1.4, 2.1]*
- [LO2] Explain and apply theories related to the visualization of information [1.2, 2.1]*
- [LO3] Explain different ways information can be visualized and the advantages and limitations of each approach in relation to visualization objectives [1.2, 1.4]*
- [LO4] Apply design principles and factors to be considered when creating information visualizations [1.1, 1.2]*
- [LO5] Analyze, describe, and classify information visualizations based on a variety of visual, physical, contextual, and interpretive attributes [1.2, 1.3]*
- [LO6] Critically evaluate an information visualization [1.4, 4.2]*
- [LO7] Design and create interactive information visualizations and infographics using open source and proprietary tools [1.1, 1.2, 1.3, 3.1]*
- [LO8] Use information visualizations to create and to communicate knowledge [2.1, 2.2]*
- [LO9] Demonstrate visual literacy skills [2.1, 2.2]*

*Course objectives are stated in terms of student learning outcomes and reference the iSchool Statement on Graduate Competencies: <https://ischool.ubc.ca/graduate/#graduate-competencies>



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FNCC specialization: The assignments in this course can serve the requirements of the First Nations Curriculum Concentration (FNCC). If students would like to take this course for FNCC credit, they are invited to contact me to discuss this option.

Course Topics:

- Theories of human visual perception and cognition
- Basic graphic design principles for the representation of information
- Understanding needs and use of information visualizations
- Understanding the data
- Transforming raw data into visualizations
- Types of information visualizations
- Understanding interaction techniques
- Tools for designing information visualizations
- Designing effective infographics
- Case studies of InfoVis and Visual Analytics applications
- Critical issues and limitations of InfoVis and Visual Analytics
- InfoVis and Visual Analytics as scientific fields

Prerequisites: ARST 575H: completion of the MAS core. LIBR 514F: completion of the MLIS core. Dual students need to have met the prerequisites for the section [ARST or LIBR] in which they are registered.

Format of the course: In-person class (i.e., lectures, activities, in-class exercises, participation, etc.) and online asynchronous activities (i.e., preparatory readings, out-of-class exercises, conceptual videos, walkthrough videos and web tutorials of InfoVis and VA tools, etc.). Participation in class activities and engagement with assigned readings and video tutorials are required. Our main learning online environment is Canvas, but we will also use other class participation tools (i.e., mentimeter, padlet). If for some reason you cannot attend one of our in-person sessions, arrangements can be made with me so that you can complete class work and participation requirements online. Please check directly with me. Happy to make it work for you.

Estimated number of weekly hours students should dedicate to this class (preparation activities + class activities): 18 hours

Required Textbooks:

- Munzner, T. (2015). *Visualization Analysis and Design*. Boca Raton, FL: CRC Press. [Available online as an e-book from UBC Library]
- Ware, C. (2008). *Visual Thinking for Design*. Burlington, MA: Morgan Kaufmann. [Available online as an e-book from UBC Library]

Required Book Chapters:

- Lankow, J., Ritchie, J., and Crooks, R. (2012). *Infographics: the power of visual storytelling*. John Wiley & Sons. Chapters: 1, 3, 8 and 9. Browse the rest of the book, check examples of infographics. [Available online as an e-book from UBC Library]
- Friendly, M. (2008). A Brief History of Data Visualization. In: Chen, C., Hardle, W., and Unwin, A. (Eds.) (2008) *Handbook of Data Visualization*. Springer Handbooks Comp.Statistics. Springer, Berlin, Heidelberg, 15-56. [Available online from UBC Library. Also available online as



a PDF at: <http://www.datavis.ca/papers/hbook.pdf>

Required Journal Articles:

- Alencar, A. B., Oliveira, M.C., & Paulovich, F.V. (2012). Seeing Beyond Reading: A Survey on Visual Text Analytics. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 2(6), 476-492. doi:10.1002/widm.1071. [Available online from UBC Library]
- Heer, J., Bostock, M., & Ogievetsky, V. (2010). A Tour through the Visualization Zoo: A Survey of Powerful Visualization Techniques, from the Obvious to the Obscure. *Queue*, 8(5), 1-20. doi: 10.1145/1794514.1805128 [Available online from UBC Library and at: <http://queue.acm.org/detail.cfm?id=1805128>]
- Heer, J. & Shneiderman, B. (2012). Interactive Dynamics for Visual Analysis: A Taxonomy of Tools that Support the Fluent and Flexible Use of Visualizations. *Queue*, 10(2), 1-26. doi: 10.1145/2133416.2146416 [Available online from UBC Library and at: <https://queue.acm.org/detail.cfm?id=2146416>]
- Keim, D., Andrienko, G., Fekete, JD., Görg, C., Kohlhammer, J., & Melançon, G. (2008). Visual Analytics: Definition, Process, and Challenges. In: Kerren, A., Stasko, J.T., Fekete, JD., North, C. (eds) *Information Visualization. Lecture Notes in Computer Science*, vol 4950. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-70956-5_7 [Available online from UBC Library and at: http://hal-lirmm.ccsd.cnrs.fr/docs/00/27/27/79/PDF/VChapter_final.pdf]
- Schwabish, J. & Feng, A. (2021). Do No Harm Guide: Applying Equity Awareness in Data Visualization. Urban Institute [Available at: <https://www.urban.org/research/publication/do-no-harm-guide-applying-equity-awareness-data-visualization>]

Course Assignments:

Assignment Name	Due Date	Weight	Learning Outcomes (LOs)	Graduate Competencies
Wrangling/visualizing data in Tableau	May 23rd	15%	2, 4, & 7	1.2, 1.3, 2.1
Interactive visualization in Tableau	May 30th	1/2 for 15%**	2, 4, & 7	1.2, 1.3, 2.1
Conceptual Midterm Exam	June 1st	20 %	1, 2, 3, 4, 5 & 6	1.2, 1.4, 2.1
Term Project Proposal*	June 6th	10 %	4 & 5	1.1, 1.2, 2.1, 3.1
Infographic	June 15th	1/2 for 15%**	2, 4, & 7	1.2, 1.3, 2.1
Term Project Final & Online Showcase*	June 22nd	25 %	4, 5, 6, 7, 8 & 9	1.1, 1.3, 2.2, 3.1
Participation	Overall	15 %	1, 2, 3, 6 & 9	1.4, 3.1, 5.3

* Assignments in teams of 2-3 students. All other assignments are individual.

** Student picks 1 out of these 2 individual assignments to complete for 15% of the Final Grade.

Course Schedule [week-by-week]

Session	Date	Topic	Readings	Assignments
1	May 16th	Introduction Characterizing information visualization and visual analytics. Introduction to Tableau	Munzner, Ch. 1 Friendly (2008) Keim et al. (2008)	
2	May 18th	Data Data types, attribute types, and dataset	Munzner, Ch. 2	



		types. Cleaning Data: Introduction to Tableau Prep Builder		
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Session	Date	Topic	Readings	Assignments
3	May 23rd	Perception and Visual Data Visual cognition and its impact on the design of information visualizations	Ware, Ch. 1, 2 & 4	Vis 1 in Tableau is due
4	May 25th	Actions and Interactions Analytical actions and interaction techniques. Interactions in Tableau	Munzner, Ch. 3 Heer and Shneiderman (2012)	
5	May 30th	Visual Encoding of Data The information visualization process, marks, channels, expressiveness and effectiveness. Visual encoding of data in Tableau	Munzner, Ch. 5 & 10	Vis 2 in Tableau is due
6	June 1st	Conceptual Midterm Exam		Midterm
7	June 6th	Idioms Keys, attributes, and idioms for multivariate datasets	Heer et al. (2010) Munzner, Ch. 7	Term Project proposal is due
8	June 8th	Infographics Visual storytelling, Infographics tools, Do-Not-Harm InfoVis.	Lankow et al. (2012). Ch. 1, 3, 8 & 9. Browse the rest of the book. Schwabish & Feng (2021)	
9	June 13th	Maps, Network and Trees Visualizations of spatial and relational data. Intro to Gephi	Munzner, Ch. 8 & 9	
10	June 15th	Design Studio Teams work on term project		Infographic is due
11	June 20th	Text and Documents Visualizations of text, documents, and collections of documents. Intro to JigSaw and Visual Analytics.	Alencar et. al. (2012)	
12	June 22nd	Term Projects Online Showcase		Term Project is due

COVID-19 Safety: Per the August 25th, 2022 [UBC Broadcast](#), you are no longer required to wear a mask, yet UBC recommends that you do in indoor public spaces. Daily health checks and frequent hand-washing are advisable. Whether you choose to wear a mask or not, please be mindful and accepting of each other's choices and comfort levels as we navigate the new academic year. Please maintain a respectful environment. See: [UBC Respectful Environment Statement](#)

If you are sick, it is important that you stay home. Complete a self-assessment for COVID-19 symptoms here: <https://bc.thrive.health/covid19/en>. In this class, the marking scheme is intended to



provide flexibility so that you can prioritize your health and still succeed. If you miss class because of illness:

- Make a connection early in the term to another student or a group of students in the class. You can help each other by sharing notes. If you don't yet know anyone in the class, post on the discussion forum to connect with other students.
- Consult the class resources on Canvas and watch fully the videorecording of the session.
- Use the discussion forum if you need additional help.
- Request a 1-1 meeting with the instructor for office hours on Zoom.
- If you are concerned that you will miss a key activity due to illness, contact the instructor to discuss.

If you are feeling ill and cannot attend class for a midterm or in-class assessment, please email the instructor right away. If you arrive for a test and you are clearly ill, I will make alternate arrangements with you. It is better to email ahead of time and not attend.

If I (the instructor) am feeling ill: If I am unwell or need to self-isolate, I will not come to class. I will make every reasonable attempt to communicate plans for class as soon as possible (by email, on Canvas, etc.). Our classroom will still be available for you to sit in and attend an online session. In this instance:

- If I am well enough to teach online, we will hold the class online (Zoom). If this happens, you will receive an announcement in Canvas informing you how to join the class.
- If I am not well enough to teach online, you will receive an announcement in Canvas with a list of activities to complete for those sessions I am not teaching.

Attendance: Regular attendance is important in this class. That being said, you must not come to class if you are feeling ill, you are self-isolating, or you have any other health related issues. *If for some reason you cannot attend one or two in-person sessions, arrangements can be made with me so that you can complete class work and participation requirements online. Please check directly with me. Happy to make it work for you.* Any request for academic concession must be clearly expressed to the instructor (see Academic Concession below).

Evaluation: All assignments will be marked using the evaluative criteria given on the [iSchool web site](#). There is only one in-class assessment: the midterm exam. If you cannot attend class for the midterm, you need to make alternative arrangements to complete your exam with me. All other assessments will be handed-in on Canvas. If you missed a deadline for one these assignments, or you know beforehand you are going to miss it, you can take 1 or 2 extra days to complete your assignment without consulting me (grace period). However, if you need more than 2 extra days to hand in an assignment after its deadline, you need to contact me as soon as possible for an extension to be approved.

Required Materials: All textbooks and reading materials for this course can be accessed online through UBC Library, Canvas, or can be found on the Internet. You will also get a free Student License for Tableau Desktop and Tableau Prep for this course. All other software used in this class is open source software or you can get free access to it. You do not need to pay for any materials for this class.

Academic Concession: If you miss marked coursework for the first time (assignment, exam, presentation, participation in class) and the course is still in-progress, **speak with me immediately** to find a solution for your missed coursework. Any concessions that will result in a change to the student record (such as late withdrawal from the course) will be referred to the Faculty of Graduate and Postdoctoral Studies for evaluation. If this is not the first time you have requested concession or classes are over, please consult the [Faculty of Graduate and Postdoctoral Studies' webpage on academic concession](#), and then contact me where appropriate.



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Policies and Resources to Support Student Success: UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here (<https://senate.ubc.ca/policies-resources-support-student-success>)

Academic Integrity: The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply when the matter is referred to the Office of the Dean. Careful records are kept in order to monitor and prevent recurrences. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the [UBC Calendar: Student Conduct and Discipline](#).

Academic Accommodation for Students with Disabilities: Academic accommodations help students with a disability or ongoing medical condition overcome challenges that may affect their academic success. Students requiring academic accommodations must register with the [Centre for Accessibility](#) (previously known as Access & Diversity). The Centre will determine that student's eligibility for accommodations in accordance with [Policy 73: Academic Accommodation for Students with Disabilities](#). Academic accommodations are not determined by your instructors, and instructors should not ask you about the nature of your disability or ongoing medical condition, or request copies of your disability documentation. However, your instructor may consult with the Centre for Accessibility should the accommodations affect the essential learning outcomes of a course.

Canvas: You are required to keep up-to-date with information on the course site within the learning portal: <https://canvas.ubc.ca/>