



DATA VISUALISATION

COURSE DETAILS

Course Code: SDNY XXXX

Instructor:

Contact Hours: 45

Credits: 3

Language of Instruction: English

Course Prerequisites: None

COURSE DESCRIPTION

The ability to understand and work with data is a key skill across a range of academic disciplines and industries. Data is everywhere and impacts many professions to process and analyse data for data visualisation. This improves decision making, assisting in communicating findings and revealing the data story to improve comprehension and persuade others.

This subject is an inter-disciplinary subject. It will enable students to develop their data literacy skills and apply this to their field of study and interests. The course will benefit students progressing to their future career, as data literacy has been identified as one of the top ten skills in the future of work ([Marr, 2022](#)). It will benefit students intending to continue in their field of research to communicate research findings. Also, students pursuing policy and advocacy careers to analyse and communicate big data sets.

The subject will focus on making sense of the world of big data. It equips students with an understanding of how the emergence of big data has expanded the power and scope of many industries and of how to make use of big data for applied purposes. Data literacy empowers students with the tools to apply critical thinking to question the integrity and purpose of the data, enabling them to reveal evidence-based insights. It introduces some key techniques for presenting, communicating, and analysing data, including data visualisation and pattern discovery.

The subject will also prepare students for the future of work, which will be impacted by generative artificial intelligence (Gen AI). By working with these tools, students will learn how to increase productive and improve analysis with text, data and images including Chat GPT 4

and Dall E. Students will also address ethical issues of using Gen AI, its limitations and biases, that require scrutiny and investigation.

Topics include:

1. Explore the principles governing perception
2. Visualising Data With Graphs Principles
3. Organise Ideas to communicate storytelling effectively
4. Sourcing Data Sets, Data Cleaning and Graphics in Excel, Data Benchmarking
5. Data Analysis Representation
6. Data Storyboards
7. Storytelling with Infographics and Social Media Posts
8. Implementing Generative Artificial Intelligence in Data Storytelling
9. Presenting for Maximum Impact
10. Identifying Limitations, Gaps and Future Research
11. Ethics, Social and Diversity Impacts of Visualisation
12. Future Careers and Data Visualisation in the Future of Work

COURSE OBJECTIVES

Data visualisation and communication is increasingly important in the field of analytics. The ability to present visual access to the huge amounts of data that business creates is an essential skill for any analyst. The creation of easily digestible visuals and graphics is often the simplest and most powerful tool to enable communication of business insights gained from data. This course aims to teach what makes effective data visualisation and how to create interactive data visualisations using Excel, PowerPoint, Wordclouds, Canva and Tableau. There is a strong focus on developing the skill of data storytelling, where students will learn to combine data, its visualisation and a narrative to create a powerful story to drive change.

Learning Outcomes

Through students' participation in this course, they will:

- Find, combine, clean, and analyse data from diverse sources,
- Recognise, compare and apply a range of static data visualisation techniques,
- Demonstrate understanding of how data analysis enables discovery and improved decision making,
- Design and create data visualisations that facilitate the discovery and presentation of data-driven stories.
- Explore data ethics and privacy issues of data analysis, including limitations, social impacts and diversity in data.

Developmental Outcomes

This course contributes to students' personal and professional development by allowing students to:

- demonstrate: responsibility & accountability, independence & interdependence, goal orientation, self-confidence, resilience, appreciation of differences.

METHODOLOGY

Classes use workshop format where students will use their own laptop or laptop provided by CEA CAPA to work on files and data sets in class.

The software to be used are Excel, PowerPoint, Canva for Infographics and data visualisation through the use of Tableau software. Students will have access to the free Tableau student edition and data sets provided by Tableau that fit with the students' discipline of study. This will enable students to apply Excel, Canva and Tableau in practical assessment tasks. Gen AI tools Chat GPT4 and Dall E will also be explored in class workshops.

This is an entry level course, with no pre-requisites. There is no coding. Beginner level of Excel is required. No previous use of data visualisation software is necessary.

Experiential Learning & Field Visits

Experiential learning is an essential component of education abroad, and participation in field activities is a required part of coursework. In this course, students explore the city in which they are studying using a variety of tools. This provides the opportunity to gain nuance and context of their context and the subject they are studying, as well as to collect information and resources for assigned papers, projects, and presentations.

Students are also strongly encouraged to participate in CEA CAPA's co-curricular program activities, which further enhance and enrich their education abroad experience and understanding of the subject matter.

GRADING

Grading Rubric

LETTER GRADE	SCORE OR PERCENTAGE	DESCRIPTION
A	93-100	Achievement that is outstanding relative to the level necessary to meet course requirements.
A-	90-92	Achievement that is significantly above the level necessary to meet course requirements.
B+	87-89	
B	83-86	
B-	80-82	Achievement that meets the course requirements in every respect.
C+	77-79	
C	73-76	
C-	70-72	Achievement that is worthy of credit even though it fails to meet fully the course requirements.
D+	67-69	
D	60-66	
F	0-59	Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.

How Grades are Weighted

The final grade is weighted as follows:

Assessment Details	When Due	Percentage
1. Class Participation/Engagement	Throughout	10%
2. Oral pitch of proposal for Final Report	End of Week 5	10%
3. Canva Infographic Social Media Campaign	End of Week 9	15%
4. Final Oral Presentation of Final Report Data Storytelling	During Week 12 class	15%
5. Final Report Data Storytelling Presentation Slides	End of Week 12	30%
6. Final reflection on data storytelling in student's career and the future of work	Week 13 in exams	20%

All assessments outlines, with detailed instructions and marking rubrics are available in Canvas.

Assessment 1 Class Participation/Engagement

Due: Throughout, Weighting 10%

Students have different experiences and insights, and a great deal of what they learn in class is from each other. The skills students acquire from participating in class and with students' group will serve them well in their future positions. Class participation means contributing to class discussion in a way that benefits classmates and helps them learn. Regular contributions are expected.

Assessment 2 Oral pitch of proposal for Final Report

Due: End of Week 5, Weighting 10%

Students will prepare a five minute pitch of the their final project. This will form the basis of the final report and presentation. Key aspects of the final project will be identified and presented in a structured pitch presentation.

Assessment 3 Canva Infographic Social Media Campaign

Due: End of Week 9, Weighting 15%

Students will create a data infographic for a social media campaign using Canva. This will be on a topic of their choice. The infographic will be assessed on clarity, composition and effectiveness in the social media platform chosen.

Assessment 4 Final Oral Presentation of Final Report Data Storytelling

Due: In Week 12 class, Weighting 15%

Students will give a 10 minute oral presentation of the final project. This will be held in the final class of the semester. The oral presentation enables the student to combine the visual representation of data story and their presentation skills to impact the audience.

Assessment 5 Final Report Data Storytelling Presentation Slides

Due: At the end of Week 12, Weighting 30%

The students will build a professional report of data visualisations using storytelling methods critical to contemporary data visualisation practice. In this assessment the students will gradually build a portfolio using techniques in data analysis and visualisation that they will learn through the course and labs. This is a progressive portfolio task that will be completed over the term. It will consist of 15 to 20 slides on the project chosen by the student.

Assessment 6 Final reflection on data storytelling in student's career and the future of work

Due: End of Week 13, Weighting 20%

Students critically reflect on their data visualisation experience through the completion of the final reflection. The reflection will be a 1,500-word assessment. The reflection will also be forward-looking and comment on how the student intends to build upon the material learn and the experience in their next academic and career professional path. The reflection will also outline how the student will continue to develop their data visualisation and other skills to prepare for the future of work.

Submissions

All written work should be submitted directly via Turnitin on CANVAS according to the due dates listed. Please keep a hard copy of all written work. Late papers will be penalized at 3% per day unless prior arrangements have been made with the instructor.

COURSE CONTENT

SESSION 1 - Explore the principles governing perception.

Topics

- Introduction to course.
- Review of assessment tasks.
- The importance of cognitive and visual perception when exploring and explaining data
- The difference between explanatory and exploratory visuals
- The major pre-attentive attributes of Gestalt principles
- How to decode and interpret graphs

Assignments & Activities

- Interpret in class case studies of data visualisations

Required Readings & Resources

- Badiu A (2021) Gestalt Principles: Understanding Its Importance in Report Design, <https://blog.enterprisedna.co/gestalt-principles-understanding-its-importance/>
- Knaflic, C (2014) Exploratory vs Explanatory Analysis, Storytelling Data, <https://www.storytellingwithdata.com/blog/2014/04/exploratory-vs-explanatory-analysis>

SESSION 2 - Visualising Data With Graphs Principles

Discover how to design graphs for clearer communication.
The appropriate graph forms to represent the five major graph relationships.
The impact of data-ink ratios on a graph's effectiveness
Distinguish between a headline and a title.

Assignments & Activities

- Lecture and instruction
- PowerPoint fundamentals and advanced techniques

Required Readings & Resources

- Franconeri S (2020) 4 Keys to Effective and Honest Data Visualizations, *Kellogg Insight*, https://insight.kellogg.northwestern.edu/article/data-visualization-honesty-infographics?utm_source=piano&utm_medium=onsite&utm_campaign=364
- McGurgan K (2015) *Data-ink Ratio and Task Complexity in Graph Comprehension*, Thesis, Rochester Institute of Technology
- Rodgers T (2022) What Type of Chart or Graph is Right for You? <https://www.tableau.com/learn/whitepapers/which-chart-or-graph-is-right-for-you>

SESSION 3 – Organise Ideas to communicate storytelling effectively

Topics

- Use introduction to generate clear main ideas
- Deconstruct an argument using the Minto Pyramid Principles
- Create a Minto Pyramid that outlines and argument, evaluating strengths and weaknesses
- Freytag storytelling framework
- Monomyth The Heroes Journey, Campbell's narrative form

Assignments & Activities

- Construct an effective Minto Pyramid on possible data visualisation topics
- Apply the Freytag storytelling framework workshop

Required Readings & Resources

- Campbell, J (2008) *The Hero With a Thousand Faces*, 3rd Edition, Prologue, Pages 1-37, New World Library, Novato.
- Gatterbauer W (2005), *The Minto Pyramid Principle or the Case for Hierarchically Structured Thinking and Communication*, *The Proseminar Quadrology*, Vol. 2, Iss. 4, Vienna.
- Yang L et al (2022) *A Design Space for Applying the Freytag's Pyramid Structure to Data Stories*, *IEEE Transactions on Visualization and Computer Graphics*, Vol 28, Iss 1, pages 922-932.

SESSION 4 – Sourcing Data Sets, Data Cleaning and Graphics in Excel, Data Benchmarking

Topics

- Data benchmarking principles
- Garbage in – garbage out, finding high quality data to analyse
- Using data cleaning techniques in Excel to prepare data for analysis
- Creating tables in Excel to present data
- Creating graphs in Excel to enhance visual storytelling

Assignments & Activities

- In class workshops on Excel
- Data benchmarking workshop

Required Readings & Resources

- Nussbaumer Knaflic C (2015) *Storytelling With Data: A Data Visualization Guide for Business Professionals*, 1st Edition, Chapter 2 and 3.
- Winston, Wayne L. (2014), *Marketing Analytics: Data-Driven Techniques with Microsoft Excel*, John Wiley & Sons, Indianapolis, IA. Chapter 3 and 4.

SESSION 5 – Data Analysis Representation

Topics

- Introduction to Tableau
- Importing data
- Creating data worksheets
- Using advanced features of Tableau to create data visualisations

Assignments & Activities

- Tableau workshop

Required Readings & Resources

- Tableau Tutorial: Getting Started with Tableau Desktop, <https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-started-tutorial-home.htm>

SESSION 6 - Data Storyboards

Topics

- Use Tableau for data storytelling
- Using Tableau data sheets to create Story Boards
- Integrating story boards to create the narrative
- Dashboard storytelling

Assignments & Activities

- Tableau workshop

Required Readings & Resources

- Tableau Tutorial: Creating a Story, <https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-started-tutorial-home.htm>

SESSION 7 – Infographics and Social Media Posts

Topics

- Infographic principles
- Introduction to Canva infographic function
- Data social media posting for effectiveness
- Designing data social media posts using Canva

Assignments & Activities

- Canva workshop for infographics
- Canva design for social media posting.

Required Readings & Resources

- Canva Design School: How to Make An Infographic <https://www.canva.com/learn/how-to-make-an-infographic/>
- Canva Design School: Design For Social Media <https://www.canva.com/designschool/tutorials/designing/design-social-media/>

SESSION 8 – Implementing Generative Artificial Intelligence in Data Storytelling

Topics

- Overview of Gen AI,
- The importance of prompts and asking the right questions
- Use of Chat GPT 4 to create research, data tables and graphs
- Use of Dall E to create visuals and images to enhance storytelling

Assignments & Activities

- Open AI and Dall E workshops
- Tableau and Canva workshops

Required Readings & Resources

- Gindham A (2023) How To Write the Perfect ChatGPT Prompt <https://writesonic.com/blog/how-to-write-chatgpt-prompts/>
- Parsons G (2023) The DALL E Prompt Book, DALLery GALLERY, <https://dallery.gallery/the-dalle-2-prompt-book/>

SESSION 9 - Presenting for Maximum Impact

Topics

- Learn how to present communications effectively.
- Taking the audience perspective, what is in it for them (WIIFT)
- Verbal delivery choices to maximise audience impact and understanding
- Present high quality persuasive slides effectively
- Determine the appropriate response to different and difficult questions.

Assignments & Activities

- Tableau and Canva workshops
- Presentation pitches

Required Readings & Resources

- Gallo C (2020) What it Takes to Give a Great Presentation, <https://hbr.org/2020/01/what-it-takes-to-give-a-great-presentation>
- Vogel W (2018) Presenting With Confidence, *Journal of Advanced Oncology*, Vol. 9, Iss 5, pages 545-548.

SESSION 10 – Identifying Limitations, Gaps and Future Research

Topics

- Identify the various types of research methodology and data limitations
- Identify gaps in the data and analysis
- Working with what you have, assumptions and prediction with limitations and gaps
- Designing for future research, overcoming limitations and gaps.

Assignments & Activities

- Tableau and Canva workshops
- Presentation pitches

Required Readings & Resources

- Price, James H. and Judy Murnan. "Research Limitations and the Necessity of Reporting Them." *American Journal of Health Education* 35 (2004): Pages 66-67.
- Theofanidis, Dimitrios and Antigoni Fountouki. "Limitations and Delimitations in the Research Process." *Perioperative Nursing* 7 (September-December 2018): Pages 155-163.

SESSION 11 – Ethics, Social and Diversity Impacts of Visualisation

Topics

- Investigate and identify ethical issues in data visualisation, including data collection, data privacy and representation
- Describe the social impacts of data visualisation, ensuring balance of argument

Assignments & Activities

- Tableau and Canva workshops
- Presentation pitches

Required Readings & Resources

- Think With Google (2023) Diversity in Advertising Trends
<https://www.thinkwithgoogle.com/consumer-insights/trending-data-shorts/diversity-in-advertising-trends>
- Zamith R (2019) Transparency, Interactivity, Diversity and Information Provenance in Everyday Data Journalism, *Digital Journalism*, Vol 7, Iss 4, Pages 470-489.

SESSION 12 – Future Careers and Data Visualisation in the Future of Work

Topics

- Overview of what students have learnt
- Final presentations by students of their data story
- Reflection of what has been learnt
- Applying the subject material to student's future careers and the future of work

Assignments & Activities

- Final Student Presentations
- Reflection on how to apply subject learnings to student's future career and the future of work.

Required Readings & Resources

- Lund S et al (2021) The Future of Work after COVID-19 McKinsey Global Institute, <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19>
- Monkey Learn (2022) 5 Data Visualization Trends of 2022 and Beyond, <https://monkeylearn.com/blog/data-visualization-trends/>

READINGS & COURSE MATERIALS

Course materials are distributed electronically and can be found on CANVAS or online. Primary documents form an essential component of course readings and discussion and should be read with care. Please note that readings listed on the syllabus may be subject to change. There is no required textbook for this course.

Additional Readings & Resources

Required reading and resources for each unit are detailed in the relevant section above. The following readings and resources are additional recommendations for this course:

Recommended Books

1. Card, S. K., MacKinlay, J. D., Shneiderman, B., (2000) *Readings in Information Visualization: Using Vision to Think*, Morgan Kaufmann, ISBN 1-55860-533-9
2. Chaomei Chen (1999) *Information Visualization and Virtual Environments*, Springer-Verlag, London, ISBN 1-85233-136-4
3. Colin Ware (2000) *Information Visualization: Perception for Design*, Morgan Kaufmann, ISBN 1-55860-511-8
4. Geroimenko, V. & Chen, C., (2002) *Visualizing the Semantic Web*, Springer-Verlag, London, ISBN 1-85233-576-9
5. Grigsby, Mike (2018), *Marketing Analytics*, 2nd Edition, Koganpage, UK.
6. Huang, M. L., Huang, W. (2013) *Innovative Approaches of Data Visualization and Visual Analytics*. IGI Global, ISBN13: 9781466643093
7. Simoff, S., Bohlen, M., Mazeika A. (2008) *Visual Data Mining: Theory, Techniques and Tools for Visual Analytics* , Springer
8. Winston, Wayne L. (2014), *Marketing Analytics: Data-Driven Techniques with Microsoft Excel*, John Wiley & Sons, Indianapolis, IA. (EBook is also available from publisher's site)

POLICIES

CEA CAPA Academic & Attendance Policies

Attendance is mandatory for all CEA CAPA classes. Expectations for attendance, consequences for tardiness or unexcused absences, and other CEA CAPA policies governing academic performance and integrity are outlined in the **CEA CAPA Academic and Attendance Policies**. Additional requirements that may be associated with a specific course or program are addressed in the on-site term syllabus.

University of Minnesota Policies & Procedures

The University of Minnesota serves as CEA CAPA's School of Record. As such, all CEA CAPA students should be aware of and prepared to respect the University's policies surrounding academic integrity.

Academic integrity is essential to a positive teaching and learning environment. All students enrolled in university courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows:

Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, please ask.

STUDENT LEARNING & DEVELOPMENT OUTCOMES

Five core CEA CAPA-wide Student Learning and Development Outcomes (SLDOs) are incorporated into all aspects of your study abroad experience.

Globalization	You are able to recognize, describe, and interpret examples of the impact of globalization in the urban environment.
Urban Environments	You are able to explore and analyze the spaces you inhabit, and reflect on differences and similarities between your home and other environments.
Social Dynamics	You are able to understand concepts of and implications of the realities of power, privilege, and inequality in urban environments.
Diversity	You are able to describe, interpret, and respect the differences and similarities within your student community and between your home country and the host country.

Personal and Professional Development

You are able to recognize the development of skills relative to personal and professional development and career preparedness: networking; communications; remote collaboration; global perspective; cultural awareness; organization; time management and prioritization; problem solving; adaptability; goal setting; and career-based or vocational skills.