

# Data Visualization

## Syllabus

## Data Visualization

### Time and Place

Online March 30, 2021– May 17, 2021

### Description

This course is part of the Key Capabilities for Data Science program and will introduce you to key concepts in machine learning.

During the course, you will work with powerful Python libraries made for data-science, including Pandas for processing tabular data and Altair for data visualization.

In this course, we will learn how to (and how not to) visualize data. We will learn about visualization grammar and how it's implemented in the “Altair” package to create our figures. In addition to common statistical visualizations, we will learn how to tell stories with data, create geographical visualizations, and bring out plots to life by adding interactive elements. Together, these skills will allow us to create effective data visualizations that strengthen our own exploratory data analysis skills and our ability to communicate insights to others.

### Prerequisites

- Programming in Python for Data Science

### Content

We are using an interactive platform that contains a series of slide decks accompanied by multiple-choice questions and interactive coding exercises to apply what you learned during the module: <https://viz-learn.mds.ubc.ca/>. We recommend using Chrome, Firefox or Safari to complete the content as other browsers are incompatible with the content platform.

### Course Software Platforms

Students will write code and perform their analysis using the Python Programming Language. Assignments, as well as the final project analysis, will be done using Jupyter Notebooks. Students will access the worksheets and tutorials in Jupyter Notebooks through Canvas. Students will require a laptop, Chromebook or tablet to complete this course.

## Learning Outcomes

By the end of the course, students will be able to:

- Use the Altair grammar of graphics to create data visualizations.
- Select an appropriate visualization for the data.
- Perform exploratory data analysis on a dataset.
- Effectively communicate findings with figures.
- Interpret data visualizations to answer questions and formulate follow-up questions.

## Course Facilitator

Position	Name	Email	Office Hours	Office Location
Course Facilitator	Analise Hofmann	ahofmann@mail.ubc.ca	Th 6:30-7:30pm PST Sat 10:00-11:00am PST	Zoom

## Course Structure

There are 7 modules in total for this course. Each module will be accompanied by an auto-graded assignment to be submitted. The students will be responsible to complete the material of 2-3 modules every 2 weeks (3 modules for weeks 1-2, 2 modules for weeks 2-4, 2 modules for weeks 4-6). In weeks 4 and 7, students will need to take an online 45-minute open-book quiz testing, material from Modules 1-4 and 5-7 respectively. This quiz can be taken at any point during the week. At the end of the 7th module, students will have an individual project to complete where they are required to use the skills they learned in the course and produce an analysis regarding an assigned dataset.

## Course Completion and Grading

You are assessed on each course according to UBC assessment guidelines to ensure the successful acquisition of required skills and concepts.

Data Visualization is part of the Key Capabilities in Data Science program. You must obtain 70% or higher in Data Visualization and complete the final project to obtain a course completion grade. To successfully complete the Key Capabilities in Data Science program, you must complete all four required courses and achieve 70% or higher for each of the four courses.

## Assignments

Each week students will submit 2 assignments for a grade. **Assignment due dates are posted on Canvas.** To open the assignment, click the link (e.g. **assignment\_1**) from Canvas. To submit your assignment, just make sure your work is saved (File -> Save and Checkpoint to be sure) **on our server** (i.e., using the link from Canvas) before the deadline. Our server will automatically snapshot at the due date/time. We have supplied informative videos on how to do this in assignment 1 and referenced the links in subsequent assignments.

## Course breakdown

Deliverable	Percent Grade
Assignments	56 (8% each)
2 Quizzes	32 (16% each)
Final project	12

## Schedule

Module	Title	Description
Module 1	Why Visualize Data?	The importance of data visualization and how a grammar of graphics can help us do so effectively.
Module 2	Visual Encoding Channels	The most and least effective ways to encode and present data graphically.
Module 3	Visualizing Distributions	How to display data distributions.
Module 4	Visualizing Distributions and Exploratory Data Visualization	How to visualize two-dimensional and categorical distributions of data as well as how to perform exploratory data analysis.
Module 5	Designing Plots for Communication	How to design effective plots for communication purposes by using colour, shapes, titles and annotation.
Module 6	Narrative, Figure Composition and Geographical Visualizations	How to construct a narrative around visualizations, compose a figure with multiple plots and create geographical plots.
Module 7	Interactive Visualizations	Bring your plots to life by adding interactivity through conditions, selection and tooltip features.

## Submission Schedule

*Assignments are due on Sunday at 6 pm. Office hours will be held twice a week to support and answer questions regarding the concepts learned in the lecture. Quizzes will be opened for up to 7 days, please check Canvas for quiz submission dates.*

Week	Modules to Complete	Submissions Due
Week 1 -2	Module 1, Module 2, Module 3	assignment_01, assignment_02, assignment_03
Week 3-4	Module4, Module 5	assignment_04, assignment_05, quiz_01
Week 5-6	Module 6, Module 7	assignment_06, assignment_07
Week 7	NA	quiz_02, final_project

## Policies

### Late Assignments

Students should submit all assignments by the due date. If for any reason a student is unable to do so, they can submit the assignments before the course end date. This is the final allowed submission date and is non-negotiable.

### Late Quizzes

We allow 2 weeks to complete the first quiz and 1 week to complete the second. If you've submitted a quiz late or did not submit a quiz at all, please contact the course facilitator and we will try to make accommodations.

### Autograder Policy

Many of the questions in assignments are graded automatically by the software. The grading computer has exactly the same hardware setup as the server that students work on. Students should make sure their assignments are *reproducible*, and run from beginning to end on the auto-grading computer. In particular, **please ensure that any data that needs to be downloaded is done so by the assignment notebook with the correct filename to the correct folder.**

### Re-grading

If you have concerns about the way your work was graded, please contact the course facilitator.

### Device/Browser

Students are responsible for using a device and browser compatible with all functionality of Canvas. Chrome or Firefox browsers are recommended; Safari has had issues with Canvas quizzes in the past.

### 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 if the matter is referred to the President's Advisory Committee on Student Discipline. 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 Academic Calendar at <http://calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,0>.

### Plagiarism

Students must correctly cite any code or text that has been authored by someone else or by the student themselves for other assignments. Cases of plagiarism may include, but are not limited to:

- the reproduction (copying and pasting) of code or text with none or minimal reformatting (e.g., changing the name of the variables)
- the translation of an algorithm or a script from a language to another
- the generation of code by automatic code-generation software

An “adequate acknowledgment” requires a detailed identification of the (parts of the) code or text reused and a full citation of the original source code that has been reused.

The above attribution policy applies only to assignments. **No code or text may be copied (with or without attribution) from any source during a quiz or exam. Answers must always be in your own words. At a minimum, copying will result in a grade of 0 for the related question.**

**Repeated plagiarism of any form could result in larger penalties**

## **Attribution**

Parts of this syllabus (particularly the policies) have been copied and derived from the UBC MDS Policies as well as the Syllabus from UBC’s DSCI 100 course.