

GGR377H1F:

Introduction to Urban Data Analytics

Department of Geography and Planning

University of Toronto

Friday, 11 AM-1 PM

Hybrid:

Online at [Zoom](#) – Oct 9, Nov 6, Nov 27, Dec 4

In person in Sid Smith 2125 – Sept 11, Sept 18, Sept 25, Oct 2, Oct 16, Oct 23, Nov 13, and Nov 20

Instructor

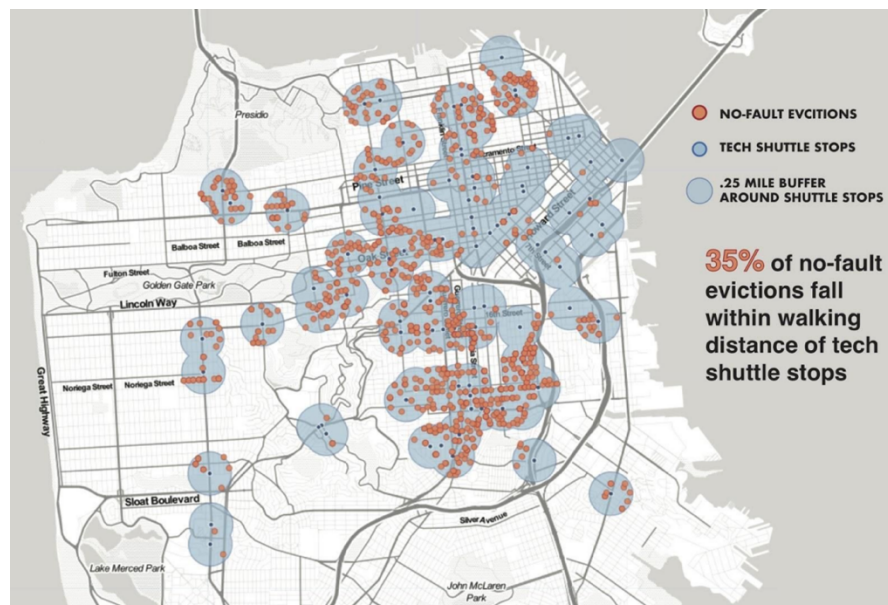
Karen Chapple – karen.chapple@utoronto.ca

Office Hours: Monday, 9:00-10:00 AM [Link for appointment](#)

Teaching Assistants

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Map of no-fault evictions near tech shuttle stops in San Francisco, 2010-16, created by Intro to Urban Data Analytics students for Assignment #3, 2017.

Course Description

This course (1) provides a basic intro to census data collection, processing, and analysis; (2) explores visualization and story mapping techniques in planning; (3) teaches methods of urban analytics; and (4) provides a socio-economic-political context for urban analytics, focusing on data ethics and governance.

GGR 377 introduces students to the systematic analysis of urban data in its institutional context including collecting, analyzing, modeling, and interpreting quantitative and qualitative data used to inform robust research, and, ultimately, urban planning practice and policymaking. Students will be introduced to theory and critical discourses on topics such as big data, open data and e-governance. Instructors will expect students to engage with technical and theoretical - with particular focus placed on ethical - considerations associated with these subjects in lecture and laboratory sections. The course will introduce students to programming in Excel and Python, using open source software for mapping, accessing open and scraped data, and other tools and techniques for urban analysis.

The course is designed to accommodate students at a variety of skill levels and with different goals. It is possible to complete all of the major requirements using Excel and GIS programs, or, via coding in Python or R. Some students will want to follow the AI Pathway, which will mean handing in AI-generated skills instead of presenting orally. Others will take the Traditional Pathway, which will mean participating in the presentations (October 9 and December 4).

The course will be structured following 3 modules:

Module 1: Introduction to Urban Data

During this module students will be introduced to fundamental data applications and ethical dilemmas in urban planning, as well as presenting data through written reports and visualizations. In Module 1, students will gain skills in working with Census data and static data visualization. The deliverable for this module will be three short problem sets, three quizzes, and a brief powerpoint profile of a Canadian neighborhood (either presented in class or submitted as an AI skill).

Module 2: Mapping and Researching the City

Next, students will learn different tools to make maps. We will gain an understanding of the basic elements of maps, how to map with online programs and geographic information systems software, and, as the module's product, how to construct story map websites. We will explore how to construct research questions and design projects, and use a story map assignment as the initial exploration for the final project. This module also includes a problem set, three quizzes, the lab midterm (which also covers material in Module 1), and a preliminary research design.

Module 3: Data Science for Urbanists: Big Data and Analytics

Finally, students will use knowledge acquired in earlier modules to explore urban data analytics as a research approach. Classes will cover topics such as big data, open data, and volunteered

geographic information; and students will gain skills in real-time and crowd-sourced data collection and use. As the final project, students will build on their exploratory assignment in Module 2 to answer a research question with innovative data sources and statistical techniques (regression or cluster analysis), either presented in class or submitted as an AI skill. This module also includes two problem sets and one quiz.

Learning Outcomes

This course is designed to introduce students to problem identification in the urban realm, and to the data collection and analysis skills relevant to addressing those problems. Through lectures, tutorials, and assignments, students will achieve the following learning outcomes:

- Identify urban problems and questions
- Understand how to use secondary data to address urban problems and questions, and become familiar with the primary data sources and metrics used
- Become a critical consumer of statistics, methods, and evidence/arguments in the press and in policy, planning and advocacy publications
- Think critically about research problems and research design, learn what kinds of problems cities face, and recognize the role of theory in shaping both questions and research design
- Design and implement a research project, using either traditional (human) or AI skills, in response to an urban problem or question
- Prepare clear, accurate and compelling text, graphics and maps for use in documents
- Learn how to effectively include data/evidence in websites.

Course Organization

Course Location

This is a hybrid course. Eight class sessions will be held in person: Sept 11, Sept 18, Sept 25, Oct 2, Oct 16, Oct 23, Nov 13, and Nov 20. Four classes will be online on Zoom: Oct 9, Nov 6, Nov 27, and Dec 4.

Access to Course Materials & Readings

All course materials will be available online, on Quercus or via the University of Toronto online library.

Submissions

Assignments are to be submitted via Quercus.

Tutorials/Practicals

Tutorial/Lab: Friday, 1-2 PM, [Zoom](#)

Assignments and Evaluation

Key Dates

Assignment Details	Due Date	Weight
Assignment 1 (Neighbourhood Profile)	October 9 (remote)	10%
Assignment 2 and 3 Proposal	October 26	5%
Quizzes #1-7	Sept 18, Sept 25, Oct 2, Oct 16, Oct 23, Nov 13, Nov 20 (in person)	10%
Lab Midterm Quiz	November 6 (remote)	10%
Problem sets #1-6	Sept 18, Sept 25, Oct 2, Nov 6, Nov 20, Nov 27	10%
Assignment 2 (Story Map)	November 16	15%
Assignment 3 (Final Project)	Dec 4 (remote)	15%
Class Participation	Weekly, September 11–November 27	5%
Final Exam	TBD	20%

Assignment Details

All assignments are to be submitted via Quercus. We will not accept assignments via email.

Assignment 1 - Neighbourhood Profile

October 9, 10%

Students may work on Assignment 1 alone or in a group of two. In this assignment, students will explore the phenomenon of neighborhood change through in-depth analysis of census data. The final deliverable – whether handed in as an AI skill or presented in class – is a PowerPoint presentation that includes (1) a location map (2) two analytic tables (3) six charts (4) ten summary bullet points and 5) a data table appendix.

Assignment 2 and 3 – Proposal for Story Map and Final Project

October 26, 5% - Assignment 2 and 3 Proposal

Students may work on Assignment 2 and 3 alone or in a group with up to two other students. Students will submit a 1-2 page description of their research question and approach, including preliminary data exploration in the story map and deeper analysis in the final project, by October 26. The instructors will provide timely feedback to help students develop a viable methodological approach.

November 16, 15% - Assignment 2 Story Map

In this assignment students will create a story map on an urban subject using urban data. The story map will consist of online maps, with significant explanatory text on the accompanying website. The purpose of this map is to explore the data that will be used in the final research project (Assignment 3).

December 4, 15% - Assignment 3 Final Project

For the third assignment, students will explore a research question of their own choosing, using big data and/or open data portals, as well as analysis and visualization techniques learned in

class. This deliverable should include either an online project or a narrative of 12-20 pages (1.5 spaces), including references in proper format.

Problem Sets #1-6

Sept 18, Sept 25, Oct 2, Nov 6, Nov 20, Nov 27 – total 10%

There will be six problem sets that will build towards Assignments 1-3. During class, the instructor will use random problem sets to spur discussion; students should be prepared to discuss their work.

Quizzes #1-7

Sept 18, Sept 25, Oct 2, Oct 16, Oct 23, Nov 13, Nov 20 (in person) – total 10%

There will be seven 5-10 minute quizzes based on the class readings, problem sets, and lectures. These will be given in-person, written longhand, open book but no computers or phones allowed.

Lab Midterm Quiz

November 6, 10%

There will a midterm lab quiz held after the second module focusing on analytic techniques taught in the first two months of class. The lab midterm will be based on the lab exercises and assignments, with a focus on analytic skills. It will be held online, during regular class (11-1) and is open book with the use of AI permitted.

Final Exam

Date TBD, 20%

The final exam will be two hours and open book (but no screens allowed). You will be given two or three urban policy problems and asked to choose one. You will then come up with ideas for a research design, including appropriate data to analyze, that will provide the city with an approach to address the problem.

Class Participation

Weekly, September 11-November 27, 5%

Synchronous lectures and labs will take place at the regularly scheduled times. Lectures will consist of a brief review of the lesson, group discussion, and help sessions when assignments are due. Students are expected to attend at least all class sessions (we will take attendance). In addition to attending, students are expected to actively contribute to class discussions and ask questions. Participation will be evaluated by instructors based on a combination of attendance and observed engagement and participation.

Lectures and tutorials (a.k.a. labs) for GGR 377 will also generally be pre-recorded and available asynchronously.

There are 8 computer labs, which will be pre-recorded as tutorials. Lab attendance is optional but strongly recommended and helps with the participation grade. Lab session time will consist of troubleshooting tricky software issues through live demos and one-on-one help sessions.

Late Penalties

Students are expected to adhere to workplace norms related to timeliness, i.e., to complete and submit their work on time. Late assignments will be accepted with a 2.5% per day penalty; however, we will not accept assignments more than one week after the due date. Missed quizzes may be made up at the discretion of the TA team, based on their availability for in-person meeting, and require a medical excuse. Exceptions apply, such as weekly participation and presentations, where there is no latitude for late assignments. Reweighting of assignments/grades is not permitted.

Required Text and Software

GGR 377 has one required book, available online at the School of Cities, [Urban Data Storytelling](#). All readings that are not part of the required book, as well as lecture slides and other course materials, will be posted to Quercus. Also, please see the course website, [Urban Data Analytics](#), for a variety of resources related to the course.

Students are expected to have a computer available for the class and should be able to access open source software including Python, QGIS, and WordPress. For the students who prefer to use Excel, it is recommended to purchase Microsoft Office rather than trying to complete assignments with Google sheets.

Students taking the AI Pathway should consider purchasing subscriptions to ChatGPT 5.6 or higher or Claude (Opus or Fable). However, it is possible to create skills using the free versions – but be careful!

Course Schedule

Module 1: Introduction to Urban Data

Week 1 (Sept 11): Introduction to Urban Data Analytics in-person class

Tutorial/Lab: Introduction to Excel/Python

Readings:

Kim, Annette. 2018. "Satellite images can harm the poorest citizens." *The Atlantic*.

Singleton, Spielman, and Folch (2018) Chapter 1, "Questioning the city through urban analytics"
[Link to Book](#)

Week 2 (September 18): All about the (Canadian) Census in-person class

Quiz #1

Tutorial/Lab: Downloading and using census data

Readings:

Urban Data Storytelling, [Overview of Canadian census data](#).

Further Reading (Not Required):

Shearmur, Richard. "Dazzled by data: Big Data, the census and urban geography." *Urban Geography* 36, no. 7 (2015): 965-968.

StatsCan. 2023. *Guide to the Census of Population, 2021*. Ottawa: Statistics Canada.

Week 3 (September 25): Static Data Visualization in-person class**Quiz #2**

Tutorial/Lab: Excel/Python basics and generating tables and charts

Readings:

Urban Data Storytelling, [Data visualization](#), [Processing and analyzing data](#)

Tufte, Edward R. 1983. *The Visual Display of Quantitative Information*. Graphics Press. Chapter 2, "Graphical Integrity".

Further Reading (Not Required):

Urban Data Storytelling, [Programming with Python and computational notebooks](#)

Few, Stephen. 2012. *Show Me the Numbers: Designing Tables and Graphs to Enlighten*. 2nd ed. USA: Analytics Press. [Lots of pictures, quick reading!] Chapter 3 pg. 39-60 "Differing Roles of Tables and Graphs", Chapter 4 pp. 53-60 "Fundamental Variations of Tables" Chapter 5 pg. 67-79 "Attributes of Pre-attentive Processing & "Applying Visual Attributes to Design", Chapter 6 pg. 101-135 "Graph Design Solutions", Chapter 11 pg. 257-270 "Displaying Many Variables at Once", Chapter 13 pg. 295-306 "Telling Compelling Stories with Numbers", Appendix A "Table and Graph Design at a Glance" pg. 309-310

Optional: Check out [Piktochart](#) for infographics, [PolicyViz](#) for urban data viz, and the [School of Cities data viz page](#) to see what we do right here in Toronto. And the whole Tufte book is great – especially check out Chapter 1, "Graphical Excellence."

Week 4 (October 2): Neighborhood Change and Indicators in-person class**Quiz #3**

Tutorial/Lab: Tables and charts: Help session

Readings:

Urban Data Storytelling, [Measuring the City: Metrics and indicators](#), [Communicating with data](#)

Further Reading (Not Required):

Urban Data Storytelling, [Exploratory data visualization](#)

[Urban Displacement Project](#)

Week 5 (October 9): Assignment 1 Due & Presentations Zoom class

Module 2: Mapping and Researching the City

Week 6 (October 16): Spatial Data and Research Design in-person class

Quiz #4

Tutorial/Lab: Mapping Part I (QGIS)

Readings:

Urban Data Storytelling, [Spatial data and GIS](#), [Spatial data in Python](#), [Spatial data processing](#)

Creswell, John W. (2014). "Chapter 1: A Framework for Design," in *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th Edition, pp. 3-23.

Further Reading (Not Required):

Reades, Jonathan. "Locating spatial data in the social sciences." In *Handbook of Spatial Analysis in the Social Sciences*, pp. 16-35. Edward Elgar Publishing, 2022.

Monmonier, Mark. 1996 Chapters 1, 2, 3, 4, and 10 *How to Lie with Maps*. University of Chicago Press.

[Additional resources for GIS mapping](#) and the U of T [Map and Data Library](#)

Singleton, Spielman, and Folch (2018) Chapter 6, "Explaining the city" : [Link to Book](#)

Kontokosta, Constantine E. "Urban informatics in the science and practice of planning." *Journal of Planning Education and Research* (2018).

Week 7 (October 23): Open Data Mackenzie Nichols, City of Toronto Open Data Portal, guest **in-person class**

Quiz #5

Tutorial/Lab: Mapping Part II

Assignment 2-3 Proposal Due October 26 at midnight!

No class October 30

Week 8 (November 6): Introduction to Story Mapping Zoom class

Midterm Lab Quiz during class!

Tutorial/Lab: WordPress, Wix, and embedding maps

Readings:

Urban Data Storytelling, [The importance of urban data storytelling](#), [OpenStreetMap](#), [Web map development](#), [Maps and visualizing spatial data](#)
SKIM the [Locus Charter](#)

Further Reading (Not Required):

Urban Data Storytelling, [Choropleth maps](#), [Bivariate choropleth maps](#), [Proportional symbol maps](#), [Flow maps](#), [Categorical dot maps](#)

Parker, Brenda. "Constructing Community through Maps? Power and Praxis in Community Mapping." *Professional Geographer*, 58:4, (2006): 470-484.

Harley, J. Brian. "Maps, knowledge, and power" (Chapter 8). In Henderson, George and Waterstone, Marvin. *Geographic thought: a praxis perspective*, 1988. 129-148.

Examples to review:

- [The Lines that Shape our Cities](#)
- [The Evolution of the American Census](#)
- [Displacement in the Bay Area](#)
- [Mapping Segregation in DC.](#)
- [Creating a neighborhood change zoning plan for Spruce Hill](#)
- [Atlas for a Changing Planet](#)
- [Katrina +10: A Decade of Change in New Orleans:](#)
- [Nature-Based Climate Solutions by The Nature Conservancy](#)
- [River of Forgiveness](#)
- [From Data to Viz](#)
- [History of Global Living Conditions](#)

You can find more examples at [ESRI's gallery](#)

Module 3: Data Science for Urbanists: Big Data and Analytics

Week 9 (November 13): Introduction to Urban Data Analytics Jeff Allen, UofT School of Cities, guest **in-person class**

Quiz #6

Tutorial/Lab: Regression

Readings:

Urban Data Storytelling, [OpenStreetMap](#), [Introduction to spatial databases](#)

Further Reading (Not Required):

Schweitzer, Lisa. 2014. "Planning and Social Media: A Case Study of Public Transit and Stigma on Twitter." *Journal of the American Planning Association* 80 (3): 218–38

Boeing, Geoff, and Paul Waddell. 2016. "New Insights into Rental Housing Markets Across the United States: Web Scraping and Analyzing Craigslist Rental Listings." *Journal of Planning Education and Research*.

Shelton, Taylor, Ate Poorthuis, and Matthew Zook. "Social media and the city: Rethinking urban socio-spatial inequality using user-generated geographic information." *Landscape and Urban Planning* 142 (2015): 198-211.

Assignment 2 Due November 16 at midnight!

Week 10 (November 20): Urban Big Data and Ethics in-person class

Tutorial/Lab: Clustering

Quiz #7

Readings:

Urban Data Storytelling, [OpenStreetMap](#), [Introduction to spatial databases](#), [Data ethics and literacy](#)

boyd, Danah, and Kate Crawford. 2012. "CRITICAL QUESTIONS FOR BIG DATA: Provocations for a Cultural, Technological, and Scholarly Phenomenon." *Information, Communication & Society* 15 (5): 662–79.

D'ignazio, Catherine, and Lauren F. Klein. 2023. *Data feminism*. MIT Press. Chapter 6, The Numbers Don't Speak for Themselves.

M. Zook, S. Barocas, d. boyd, K. Crawford, E. Keller, S.P. Gangadharan, et al. (2017) "[Ten simple rules for responsible big data research](#)."

Further Reading (Not Required):

G.C. Bowker and S.L. Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, MA: MIT Press, 2000), Introduction ("To Classify is Human"), read pp. 1-16.

Suel, Esra, John W. Polak, James E. Bennett, and Majid Ezzati. "[Measuring social, environmental and health inequalities using deep learning and street imagery](#)." *Nature scientific reports* 9,1 (2019): 1-10.

Thackway, William, Matthew Ng, Chyi-Lin Lee, and Christopher Pettit. "[Implementing a deep-learning model using Google street view to combine social and physical indicators of gentrification](#)." *Computers, Environment and Urban Systems* 102 (2023): 101970.

Week 11 (November 27): Urban Data Analytics, part II Zoom class

Tutorial/Lab (choose one or more): More on Python, big data manipulation, Geopandas

Further Reading (Not Required):

Schwabish, Jonathan. 2017. Chapter 1 "Theory, Planning and Design"; Chapter 4 "The Text Slide"; and Chapter 5 "The Data Visualization Slide"; in [*Better Presentations: A Guide for Scholars, Researchers, and Wonks*](#). New York: Columbia University Press.

Week 12 (December 4): Assignment 3 Due & Presentations Zoom class

Tutorial/Lab: Help session

Course Policies & Expectations

Communication

Make sure you consult the course outline/syllabus, Quercus and other course materials before submitting inquiries. Please also ensure course notifications are set to "on" in Quercus. Send all electronic communication for this course using your University of Toronto e-mail. We do not expect you to report to us when you will miss class. If you wish to report an absence for some reason, please only email your teaching assistant (i.e., the TA in charge of your tutorial). However, if you are or will be temporarily absent from your studies and need academic consideration for a missed academic obligation (e.g., test, quiz, paper), you can formally declare your absence in ACORN by using the [ACORN Absence Declaration Tool](#).

Classroom Environment

Students are expected to behave in a professional and respectful manner in class, by arriving on time, not interrupting, and offering constructive comments and feedback.

Group Work

Group assignments are generally assessed on a collective basis, meaning you receive the same grade as the rest of your group. However, if circumstances dictate - for example, if you or a teammate do not make collegial contributions to the group - we may choose to assess the assignment on an individual basis, meaning you may receive a different grade than the rest of your group. If group dynamics prove to be problematic, we may ask for peer grading by surveying groups.

Use of Generative AI (e.g., ChatGPT)

You are free to use generative AI for assignments in this class. Be careful, though! It's not very good at data viz. And the free versions make stupid mistakes.

Extension Requests

If you foresee any problems meeting submission deadlines, please contact your teaching assistant as soon as possible. Extensions without penalty will be granted for reasons of accommodation, illness or emergencies when appropriate documentation is submitted to the instructor. A sign of professionalism is being able to plan and let your colleagues/supervisors know if you expect to have trouble meeting a deadline. We are here to help, but please reach out early, not the night before work is due!

Copyright and Intellectual Property

Any lectures or seminars prepared by the instructor are considered by the University to be the instructor's intellectual property covered by the *Copyright Act, RSC 1985, c C-42*. Course materials such as lecture slides and seminar presentations by other students in the course are made available to you for your own study purposes. These materials cannot be shared outside of the class or "published" in any way. You are expected to respect both the intellectual property of the instructor and the privacy of your fellow students. Posting recordings or slides to other websites without the instructor's permission constitutes copyright infringement.

Academic Integrity

Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course, unless permission has been obtained from the instructors in all relevant courses. You may use words or ideas written by other individuals in publications, websites, or other sources, but only with proper attribution. If you are not clear about the expectations for completing an assignment or taking an exam, be sure to ask a course instructor.

You should also keep in mind that as a member of the campus community you are expected to demonstrate integrity in all of your academic work and be evaluated on your own merits. The University of Toronto's [*Code of Behaviour on Academic Matters*](#) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. The consequences of cheating and academic misconduct — including a formal discipline record and possible loss of future opportunities — are not worth the risks.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the *Code of Behaviour on Academic Matters*. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, please reach out to the instructors.

Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

Academic Accommodations

Accommodations due to illness or emergency: In order to receive academic accommodations, students will need to record absences through the Absence Declaration tool on [ACORN](#) (under the Profile and Settings menu).

Students with disabilities: The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs. Students with diverse learning styles and needs are welcome in this course. If you have a disability that may require accommodations, please feel free to approach me and/or the [Accessibility Services office](#).

Religious observances: The University provides reasonable accommodation of the needs of students who observe religious holy days other than those already accommodated by ordinary scheduling and statutory holidays. Students have a responsibility to alert members of the teaching staff in a timely fashion to upcoming religious observances and anticipated absences and instructors will make every reasonable effort to avoid scheduling tests, examinations or other compulsory activities at these times. Please reach out to your teaching assistants as early as possible to communicate any anticipated absences related to religious observances, and to discuss any possible related implications for course work.

Mental Health Statement

Supporting Mental Health in the U of T Community

As a student at U of T, you may experience circumstances and challenges that can affect your academic performance and/or reduce your ability to participate fully in daily activities. An important part of the University experience is learning how and when to ask for help. There is no wrong time to reach out, which is why there are resources available for every situation and every level of stress.

Please take the time to inform yourself of available resources, including:

[Mental Health](#)

- [Your College Registrar](#)
- [Student Mental Health Resource](#)
- [Safety & Support website](#)
- [Health and Wellness Centre](#)
- [Emergency support if you're feeling distressed](#)
- Additional mental health resources can also be found on the [Geography website](#)

Other Student Services and Support Resources

- [Accessibility Services](#)

- [Academic Success Centre](#)
- [Mental Health Resources \(Geography and Planning website\)](#)
- [Links to Additional Student Services and Support Resources](#) (general services and support for students, international student support, Health & Wellness, financial aid and professional development)