GGR377H1F:
Introduction to Urban Data Analytics
Department of Geography and Planning
University of Toronto
Friday, 11 AM-1 PM

Online at Zoom except Sept 6, 13, 27 & Oct 18 in McLennan Physical (MP)
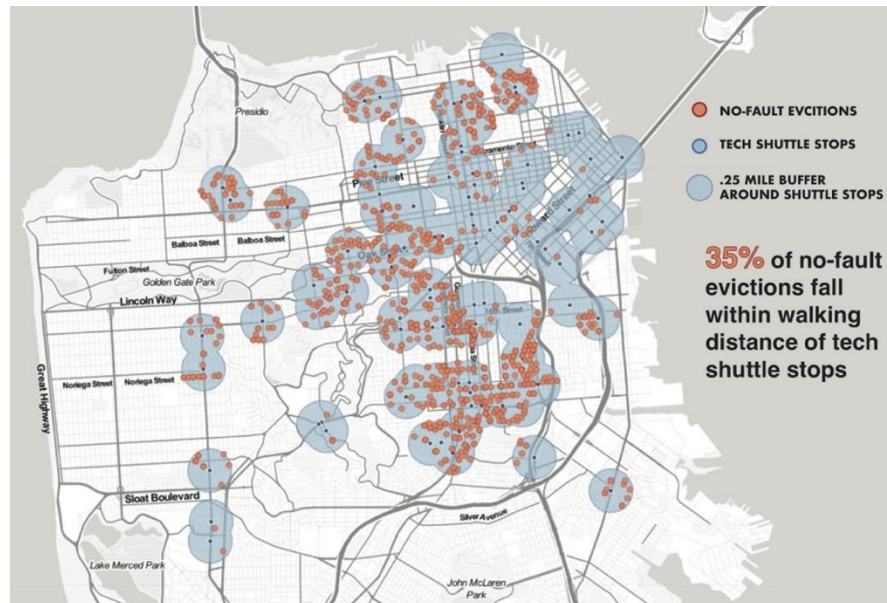Laboratories, Room 134

Instructor
Karen Chapple – karen.chapple@utoronto.ca
Office Hours: Monday, 9:00-10:00 AM Link for appointment

Teaching Assistants
Mickey Chen, mickey.chen@mail.utoronto.ca
TBD

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 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 a descriptive profile of a Toronto neighborhood.

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.

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.

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 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 writing and websites.

Course Organization

Course Location
This is a hybrid course. Four class sessions will be held in person: Sept 6, 13 & 27, & Oct 18.

Access to Course Materials & Readings
All course materials will be available on Quercus or via the University of Toronto online library.

Submissions
Assignments are to be submitted via Quercus.

Tutorials/Practicals

Tutorial/Lab 1: Friday, 1-2 PM, Zoom

Tutorial/Lab 2: Friday, 2-3 PM, Zoom

Assignments and Evaluation

Key Dates

Assignment Details	Due Date	Weight
Assignment 1 (Neighbourhood Profile)	October 4	20%
Assignment 2 and 3 Proposal	October 21	5%
Midterm Quiz	October 25	10%
Lab Midterm Quiz	November 8	10%
Assignment 2 (Story Map)	November 11	15%
Reading Response Questions	Weekly, September 13-November 22	5%
Class Participation	Weekly, September 6–November 29	5%
Assignment 3 (Final Project)	December 18	30%

Extra credit: Final presentation (up to 3%, or 3 extra points)

Assignment Details

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

Assignment 1 - Neighbourhood Profile

October 4, 20%

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. For students working in pairs, the Neighborhood Profile will be a document of 8-10 pages (1.5 spaces), plus appendices (submitted online in Word or as a PDF); for students working alone, the requirement is 6-8 pages (1.5 spaces), plus appendices (submitted online in Word or as a PDF).

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

October 21, 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 21. The instructors will provide feedback to help students develop a viable methodological approach.

November 11, 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 18, 30% - 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. Projects should use generative AI in the analysis and discuss the effectiveness of deploying AI.

Midterm Quiz

October 25, 10%

There will be a short multiple choice midterm quiz held during the second module to assess student learning of course topics (based on the class readings and lectures).

Lab Midterm Quiz

November 8, 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.

Reading Response Questions

Weekly, September 13-November 22, 5%

Students are expected to respond to five different sets of class readings by submitting at least three questions that demonstrate a high level of awareness and react critically to concepts and analyses presented by the readings and could be used to prompt an in-class discussion. Each question should respond to a different reading unless fewer than three readings are assigned. During each class, the instructor will randomly select one or more of the questions to read and discuss during the lecture. Students should be prepared to engage in a discussion around their questions. Questions should be posted by midnight the day before class to the Quercus discussion thread for the lecture (e.g., September 12 for September 13 class).

Class Participation

Weekly, September 6-November 29, 5%

Lectures and tutorials (a.k.a. labs) for GGR 377 will generally be pre-recorded and available asynchronously. The teaching team will try to post lectures and labs for the week by Tuesday night at the latest.

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 keep their video on, actively contribute to class discussions, and ask questions; if you are shy, use the chat! Participation will be evaluated by instructors based on a combination of attendance and observed engagement and participation.

There are eight 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.

Extra credit: Final presentation (optional)

November 29, up to 3%

The term will culminate with short (5-7 minute) presentations of Assignment 3 (during the last class). This presentation is optional and will be for extra credit, up to 3 points on top of the final mark. All members of the group are expected to speak.

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 5% per day penalty; however, we will not accept assignments more than one week after the due date. 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

GGR 377 has one required book, available online at the U of T library. 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.

Required: Singleton, Alex, Seth Spielman, and David Folch. 2018. Urban Analytics. Thousand Oaks, CA: Sage. Available at U of T library: [Link to Book](#)

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.

Course Schedule

Module 1: Introduction to Urban Data

Week 1 (September 6): Introduction to Urban Data Analytics* in-person class

Tutorial/Lab: Introduction to Excel/Python

Readings:
Singleton, Spielman, and Folch (2018) Chapter 1, "Questioning the city through urban analytics"

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

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.

*Note: Reading response due by midnight on Sept 12

Week 2 (September 13): All about the (Canadian) Census in-person class

Tutorial/Lab: Downloading and using census data

Readings:
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. [SKIM]

Week 3 (September 20): Static Data Visualization

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

Readings:
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

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

Optional: Check out Piktochart for infographics and PolicyViz for urban data viz. And the whole Tufte book is great – especially check out Chapter 1, "Graphical Excellence."

Week 4 (September 27): Neighborhood Change and Indicators (Dr. Jeff Allen, guest) in-person class

Tutorial/Lab: Tables and charts: Help session

Readings:

Singleton, Spielman, and Folch (2018) Chapter 5, "Differences Within Cities"

Robert Weissbourd, Riccardo Bodini and Michael He (2009). Dynamic Neighborhoods: New Tools for Community and Economic Development. RW Ventures for Living Cities. [SKIM]

Urban Displacement Project,[SKIM]

Module 2: Mapping and Researching the City

Week 5 (October 4): Research Design and Urban Data Science

Tutorial/Lab: Mapping Part I (QGIS)

Readings:

Singleton, Spielman, and Folch (2018) Chapter 6, "Explaining the city"

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

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

Week 6 (October 11): Spatial Data & GIS Fundamentals

Tutorial/Lab: Mapping Part II (TBD)

Readings:

Singleton, Spielman, and Folch (2018) Chapter 4, "Visualizing the city"

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

Week 7 (October 18): Introduction to Story Mapping in-person class

Tutorial/Lab: WordPress, Wix, and embedding maps

Examples to review (for commentary, explain what makes them work well as a story!):

- [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](#)
- [Gangs of Los Angeles (2015):](#)
- [Atlas for a Changing Planet](#)
- [Transportation Access Storymap](#)
- [Katrina +10: A Decade of Change in New Orleans:](#)
- [Nature –Based Climate Solutions by The Nature Conservancy](#)
- [River of Forgiveness](#)

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

For a cool tool, check out [Street View historical download tool,](#) created by students from this class!

Week 8 (October 25): Power, Mapping, AI, and Ethics

Midterm Quiz during class!

Tutorial/Lab: Intro to AI

Readings:

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

Norwood, Carla, and Gabriel Cumming. "Making maps that matter: Situating GIS within community conversations about changing landscapes." *Cartographica: The International Journal for Geographic Information and Geovisualization* 47.1 (2012): 2-17.

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

SKIM the [Locus Charter](#)

Check out the [Street Story](#) Project

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

Week 9   (November 8): Introduction to Big Data and Ethics

Tutorial/Lab: Midterm lab quiz!

Readings (pick any 3):
Singleton, Spielman, and Folch (2018) Chapter 2, "Sensing the city"

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

B. Strasser and P. Edwards, "Big Data is the Answer---But What is the Question?" *Osiris* 32, 2017: pp. 328-345 in Jurjevich, J. R., Griffin, A. L., Spielman, S. E., Folch, D. C., Merrick, M., & Nagle, N. N. (2018).

Foster, Ian, Rayid Ghani, Ron S. Jarmin, Frauke Kreuter, and Julia Lane. 2017. "Introduction." Pp. 1-19 in *Big Data and Social Science: A Practical Guide to Methods and Tools*. Boca Raton, FL: Taylor & Francis Group.

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.

M. Zook, S. Barocas, d. boyd, K. Crawford, E. Keller, S.P. Gangadharan, et al. (2017) "Ten simple rules for responsible big data research." PLoS Comput Biol 13(3).

Week 10 (November 15): Urban Data Analytics and Interactive Visualization

Tutorial/Lab: Web scraping and visualization

Readings (pick any 3):
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.

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.

Stewart, Matthew. 2019. "The Real Estate Sector is Using Algorithms to Work Out the Best Places to Gentrify." *Failed Architecture*.

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.

Hemmersam, Peter, Nicole Martin, Even Westvang, Jonny Aspen, and Andrew Morrison. 2015. "Exploring Urban Data Visualization and Public Participation in Planning." Journal of Urban Technology 22 (4): 45–64.

Anderson, Meghan Keaney. 2016. "12 Complex Concepts Made Easier Through Great Data Visualization — ReadThink (by HubSpot)." Medium. June 27.

Explore additional interactive visualizations here:

From Data to Viz

History of Global Living Conditions

Equitable Washington DC

Week 11 (November 22): More on Analytics, Plus Presenting Data

Tutorial/Lab (choose one or more): Big data manipulation, geopandas, and clustering

Readings:

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.

Tufte, Edward, R. 2003. *The Cognitive Style of PowerPoint*. Graphics Press.

Doumont, Jean-luc. 2005. "The Cognitive Style of PowerPoint: Slides Are Not All Evil." *ResearchGate* 52 (1): 64–70.

Parker, Ian. May 28, 2001. Absolute Powerpoint: Can a software package edit our thoughts? *The New Yorker*.

Week 12 (November 29): Conclusion (and extra credit presentations)

Tutorial/Lab: Extra credit presentations

Readings:

Singleton, Spielman, and Folch (2018) Chapter 8, pg. 151 "Networks Supporting Human Progress" & Chapter 9, "The Future of Urban Analytics"

Zook, Matthew. "Crowd-sourcing the smart city: Using big geosocial media metrics in urban governance." Big Data & Society 4, no. 1 (2017).

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
This is an hybrid course and students are expected to attend online sessions with their video on. If you are unable to turn on your video during class, please let your teaching assistant know. Close all other applications on the device you are using to access and participate in the course. 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)
The work you submit for assignments and quizzes must be your own. You may, however, use generative AI to support your work on assignments in the following ways:

- To answer general questions about high-level concepts covered in this course or assignment
- To provide examples of the usage of the library's API
- To summarize information for your own understanding
- To correct English grammar
- To clean and correct your data
- To assist with understanding and debugging errors in code.

Assignment 3 will actually ask you to use AI in the analysis.

Please note that any uses of generative AI beyond the ones listed above are not permitted, and will be considered use of an unauthorized aid, which is an academic offense.

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)