Comp 4202
Computational Aspects of Geographic Information Systems

Through recent advances in technology such as navigation systems, mobile devices, changing user demands and new software such as Mapquest and Google Earth, the field of GIS is becoming increasingly important and also very interesting from a CS perspective. Many aspects of our daily lives are effected, the commercial impact/potential of GIS is tremendous, and novel algorithmic and applied problems need to be solved. This course lays the foundations to understand, use and further this technology.

Learning Modality

In Fall 2021, content for this course will be delivered online. Initially, at least, the plan is to do it as ZOOM Live Stream from a set-up I created at my home that includes a whiteboard. Students can tune into at the scheduled time (see the lecture schedule below). We will do interaction during these lectures. The lectures will then be shared via Brightspace.

Prerequisite: A 3rd year course in Data Structures and Algorithms or the equivalent.

Course Objectives

This is a recent course for UG students. You will learn about Geographic Information, its principles, techniques used and analysis of geographic/spatial data. You will be able to understand what is inside a GIS, underlying algorithms and be able to use a system. Having taking this course, you will be able to answer e.g., how do they visualize disease spread, how does Google determine the best route algorithmically.

Lecture Schedule

Sept 8　– Dec 10

Days	Time Location
Tuesdays	10:05 -11:25 Lecture
Thursdays	10:05 -11:25 Lecture

I anticipate to make the lectures available via Brightspace for subsequent viewing.

My office Hours Schedule

Days	Time Location
Wednesdays	14:00 -15:00 Online

Office hours during which our TA can help you with studying course material and offer you guidance for assignments will be posted here when they become available.

Important Dates (to be finalized)

Date	Due
September 30	Project and Class presentation proposal
October 19 and 221	Class presentations
December 7	Project write-up
December 9	(Brief) project demos
December	CU scheduled Final

Textbook

My students can access the Course Material via Brightspace.

Grading Scheme

I. 2 Assignments (each 15%)	30%
II. Class participation	5%
III. Choose exactly 2 out of these a, b, or c:	
a) Class presentation incl. write-up	20%
b) Project/Survey including write-up)	20%
c) Tutorials	20%
IV. Final exam	25%

Assignments

Assignments will be posted as they become available.

Please note the following rules and requirements about assignments:

- Late assignments will not be accepted.
- Assignments emailed to me will not be accepted.
- I will not respond to emails sent shortly before or after assignment deadlines asking for exceptions to the preceding two rules.
- You can type your solutions, or write them by hand and scan them (for example, using a scan app on your phone or using a real scanner).
- Solutions written-up in LaTeX are preferred, but not strictly required. In case you want to learn LaTeX, here is a tutorial. Learning LaTeX is a useful exercise, since many programs (including Microsoft Word) now use LaTeX for typesetting formulas.

• Each assignment must be submitted as one single PDF file through cuLearn.

Project

This is the nicest part of the course. Students are almost always finding some project that they like. Projects can be implementation-oriented or theory-based. In almost all cases, I would recommend an implementation-oriented projects. **The class presentation and the topic of the project need to be distinct to allow for maximal learning.**

• Implementation Projects

For implementation projects you would typically implement different data structures or algorithms. Then, their performance is established through rigorous experimental testing. The write-up contains a description of the data structures algorithms implemented and tested, the tests carried out and the results of the experiments. Should the results show interesting behaviours, they must be explored and discussed. Projects are e.g., finding "best" bicycle routes inside Ottawa, improving the OCTranspo system …

You will get a chance to demonstrate your projects to me and your class mates in a special demonstration class.

• Theory Projects

Don't choose this if you are not research-oriented. You are encouraged to work on an open problem mentioned in class or stated in the literature. It may happen that you cannot solve the open problem proposed. In this case, you should describe the approaches attempted and the reasons why they did not work. Marking then focuses on the write-up, including the survey depth, and the strength of the approaches attempted.

Class presentations

The class presentations give you a great opportunity to practice giving a talk. Here, the objective is for you to learn to speak talk in front of people. This will be useful if you are in academia or industry. Then, the stakes are higher and it is nice to

practice in front of equals. I will give you feedback how to improve. Depending on the class size, we might get 20 minutes per talk (t.b.d.).

Tutorials

ESRI has developed some tutorials to learn how to use its products. We are choosing several such tutorials that you go through, make snapshots of how you did and then add some additional tasks (which we will specify).

Exams

The final exam will take place online. The rules will be communicated later. At this point,
They are as follows: At the scheduled exam time, the exam will proceed with:

- You will login to Zoom with your camera turned and using your full real name.
- The Zoom session will have instructions on how to access the online exam
- If you have a question during the exam, you can "raise your hand" (a Zoom feature) and an exam proctor will contact you through Zoom chat.
- At some point during the exam, a proctor will check your student id (sign in).
- When you have completed and submitted your online exam, you will "raise your hand" and an exam proctor will contact you through Zoom chat to give you permission to leave (sign out).

Any online exams completed by a student who did not properly sign in and sign out will be discarded.

Academic Integrity (New—Please Read)

As of 2020, there are penalties in place for academic integrity violations. These will be issued by the Associate Dean (Undergraduate Affairs) of Science to students who copy, in whole or in part, work they submit for assignments.

- First offence: F in the course
- Second offence: One-year suspension from program
- Third offence: Expulsion from the University

These are standard penalties. More-severe penalties will be applied in cases of egregious offences. Failure to inform yourself of the expectations regarding academic integrity is not a valid excuse for violations of the policy. When in doubt, ASK your instructor or TA. For more information check the ODS website

Accommodation Statement

Carleton University is committed to providing access to the educational experience in order to promote academic accessibility for all individuals. Here is information on how to apply for academic accommodation.