CRP 384: Transportation accessibility and equity analysis

Spring 2018

Meeting time and location
M 5:00-8:00pm
West Mall Building 1.110

Instructor
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Office hours
To be determined
WMB 4.126

Course overview

Geographic information systems (GIS) are indispensable for transportation-related analyses. Whether forecasting future conditions under alternative transportation investment scenarios, taking an inventory of a city’s pedestrian and cycling assets, or assessing pavement conditions throughout a state, transportation systems are inherently spatial and their management requires the collection of spatial data and the use of spatial analytical techniques. In addition to these applied and practice-oriented considerations, the academic literature on GIS and transportation (GIS-T) is exploding. Transport geography is a well-established sub-discipline and new data and methods are opening up exciting new research questions and analytical possibilities.

In this course, we will learn both traditional and contemporary GIS-T methods by working with real methods and data that speak both the mundane (e.g., the preparation of regional transportation plans) and innovative (e.g., API queries) aspects of transportation planning. Owing to the focus on transportation planning, we will often be assessing data and measures that reflect actual or modeled travel behavior including observed origins and destinations, travel times and costs, and mode and route choices, among others. Because of the wealth of existing data in this realm, we will generally not be covering the data collection methods that would be required to, for example, assess infrastructure conditions (e.g. sidewalk quality, bridge age and remaining life).

The course will operate as an applied research seminar, blending traditional lectures, hands-on labs, and in-class discussion components. Its overarching goal is for students to become fluent in a number of different GIS-T and related software tools and data sources and to apply them to answer questions of practical relevance. Two major focus areas—accessibility and equity—will shape the questions we will address. You will find that, in the field, there is often a best practice or typical approach that is employed to address a particular problem. In Transportation Accessibility and Equity Analysis you will learn about

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1 Note that this syllabus is subject to change. The most up-to-date version will always be posted on Canvas and revisions will be announced in class and/or by e-mail. This version is current as of 10/26/2017.
many different ways (some better and some worse) that they can be approached. It is my hope that, when working as a transportation planner or GIS professional, you will question traditional approaches and seek to bring the advanced data and methods that you will learn about in this class to bear on your work.

Note: you should have completed introductory training in GIS before enrolling in this class. I will take your familiarity with basic GIS concepts and approaches for granted. Please see me before enrolling if you are uncertain about your qualifications.

Learning objectives

Upon completing this course, students will have acquired new skills (and solidified existing ones) through in-class discussion and debate, lab exercises, detailed analysis and thoughtful reflection in assignments, and a synthetic final project.

Specifically, the course has three categories of learning objectives related to: 1) applying GIS-T methods and data to address accessibility and equity challenges, 2) specific pieces of software, tools, and data and 3) general programming and GIS best practices. Some of these objectives you may already be familiar with while others might be completely new. Even if we do not cover a specific problem type during the class, once it is over, you should be familiar with the types of problems that GIS-T methods can solve and the data available to solve them. You will be able to interrogate the implications of specific analytical choices (e.g., areal units, data sources, metrics) to determine the best approach for a given situation.

Specific learning objectives within each of the three categories are as follows:

Accessibility and equity

1. Accessibility—defined simply as the ability to access opportunities separated in space— is the fundamental benefit conferred by a transportation system. Accessibility undergirds travel behavior and land use. Students will calculate, compare, and critically evaluate different measures of multimodal accessibility in a GIS-T environment.

2. Social equity, fairness, and justice are transportation planning goals embedded in federal law and guidance but whose analysis is often poor or nonexistent. Additionally, evidence is mounting that more equitable cities and regions are also more economically competitive and environmentally sustainable. Students will use results drawn from their GIS-T investigations to operationalize and assess equity conditions in cities and regions across the United States.

Specific software, tools, and data

Students will gain proficiency in contemporary software, tools, and data to assess accessibility and equity in transportation systems including:

1. ESRI Network analyst to calculate service areas, travel times, and routes.
2. Python scripting to automate common geoprocessing tasks.

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3. OpenStreetMap as a source of free, readily accessible data with which to build routable networks.
4. US Census Bureau and socialexplorer.com as valuable sources of demographic and employment information.
5. General Transit Feed Specification (GTFS) data to represent transit networks and travel times by public transit within a GIS-T framework.
6. Application programming interface (API) queries to ingest data from the web and apply them to solve spatial problems.
7. R for statistical computing and advanced GIS applications.
8. Other software, tools, and data according to student interests.

General programming and GIS best practices
In addition to these explicitly-taught learning objectives, students will also gain invaluable experience with data management and programming including:

1. Troubleshooting and resolving challenging problems that arise when using a particular piece of software or developing your own scripts.
2. Writing elegant and well-commented scripts and code.
3. Acquiring, organizing, and managing large amounts of data and complex analyses.

Course expectations and policies
Attendance
While attendance during all class periods is highly encouraged, as graduate students I trust that you can manage your own time. When attending, please arrive to class on time and stay the entire period unless you’ve discussed other arrangements with me. Students alone are responsible for any material missed due to their absence.

Readings
There is no assigned textbook for this course. All readings are available either on Canvas or are linked to from this syllabus. I have chosen the readings carefully and have generally only assigned one reading per week, which should be very manageable. While most are academic articles, they are drawn largely from the applied transport geography literature, and should appeal to students in this class. In many cases, the papers will provide examples of approaches we will later implement in labs and assignments. For this reason, carefully reading the assigned material before class is vitally important. (See further information in the assessments section below.)

Use of laptops, phones, and other devices
The use of electronic devices during class (laptops, cellphones, etc.) is generally permitted. Even though we are meeting in a computer lab, you may find it valuable to bring your personal laptop to class to follow along with the demonstration of a particular piece of software or a particular data source, especially if you want to keep all of your data local and work on things easily from home or elsewhere. Please turn all cell phones to silent (not vibrate) during class time. To avoid distraction and for the benefit of your fellow students, please refrain from using devices for non-class material during class time.

Disability accommodations
Any student requesting accommodations because of a disability will be referred to Services for Students with Disabilities. The staff will work with you to arrange for appropriate accommodations. The student will receive an accommodation letter that will be reviewed with me.
Plagiarism and cheating
We will be completing writing assignments for this course. Plagiarism involves using the words or ideas of another person as your own. It is perfectly acceptable to borrow ideas from other scholars. Indeed, this is how scholarship advances. But those words and ideas must be appropriately referenced with a citation and page number, as appropriate. Please use APA format for work prepared for this class. If you are planning to continue in academia, it will be in your interest to learn to use one of the many pieces of citation management software. Zotero is a great option that’s free for everyone.5

If you are caught plagiarizing or cheating, you will be dealt with according to the University of Texas Honor Code. For any questions involving these or any other Academic Honor Code issues, please consult me or http://catalog.utexas.edu/general-information/appendices/appendix-c/student-discipline-and-conduct/. If you are not sure what constitutes cheating or plagiarizing, please come see me.

Assessments
The student assessments for this course will involve a mix of in-class participation, labs, written assignments, and a final project presentation and report. Some of these will be completed in groups, but unless explicitly identified as group work, all work is to be completed by you alone. Details regarding each assessment category are provided below.

Participation
I encourage active and constructive participation from students during class time. Since you are all graduate students with interests in planning and GIS, I expect that you will have strong opinions about which data and methods should be used to best address transportation planning challenges. Our readings will also provide fodder for discussion. Please share your opinions during class while being respectful of other students’ opinions and time. We will sometimes have structured in-class participation activities involving small group discussions combined with reporting back to the larger class. Students are expected to be active and engaged during these times. These activities are designed to provide students who are less comfortable speaking in a large group the opportunity to be heard and to solidify key learning objectives through deeper student engagement.

Reading quizzes
In my prior teaching, I’ve found that one of the most effective ways to make sure the students complete the required readings ahead of time is to provide a concrete incentive. For this reason, there will be nine “reading quizzes” throughout the semester that you will complete before class (either on Canvas or an alternative platform, with details to be announced in class). The quizzes will consist of two questions, one multiple choice and one short answer. The multiple choice question will be worth one point and the short answer will be graded on a three-point scale. The quizzes will be designed so that if you do the reading you should easily get 4/4, but I will also endeavor to make reading specifically for the quiz difficult. You will have to demonstrate a nontrivial understanding of the material to receive three points on the short answer question. I’ll review the quiz responses to frame our initial discussions in class and to understand how well students are able to read the assigned work. The quiz will open at 9am on the day before class on which the reading is assigned and will be due by midnight the same day. I will review responses before class and incorporate them into our discussion of the readings.

Labs
Because there is no formal lab time scheduled for the course, some of the class periods will be run as traditional lab sessions where students will have an opportunity to work on an applied problem using

5 https://www.zotero.org/
GIS and related software. There will generally be one of these each week, although some weeks will have two and others none. Labs will provide hands-on experience with the software, data, and methods that are the core of the course. Within several days of a lab period (as noted within each lab), you will submit a brief lab report which will be graded on a pass/fail basis. You may occasionally need time in addition to the meeting period to complete a lab assignment. Generally, if you attend all labs and complete the required report you will receive full credit for the lab portion of the course. The lab materials will be cumulative, so if you must miss one due to absence, I strongly suggest that you quickly make it up.

Assignments
Students will complete two written assignments, with due dates and times outlined in the course schedule. The assignments will provide students with the opportunity to demonstrate mastery of the GIS-T skills discussed in class as well as the application of critical perspectives to the methods used and results generated. Assignments will be distributed on Canvas and announced in class.

Final project
Students will complete a final project presentation and report that includes a cumulative demonstration of the knowledge gained over the semester. In addition to a full project report, the last three lecture periods are reserved for short presentations of the project results. Further details on expectations and requirements for the final project will be distributed later in the semester.

Policy on late work
All written work must be turned into Canvas at the date and time noted on the assignment prompt. Work submitted late will receive reduced credit of five points (on a traditional 100-point grading scale) per day or portion of day late, unless prior arrangements have been made with the instructor.

Grading
All grades may be adjusted upward or downward depending on the distribution resulting from a particular assessment. Final grades will be based on the following five components, weighted as shown:

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<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>In-class participation</td>
<td>5</td>
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<tr>
<td>Reading quizzes</td>
<td>5</td>
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<tr>
<td>Labs</td>
<td>10</td>
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<tr>
<td>Assignments (two total)</td>
<td>40</td>
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<tr>
<td>Final project presentation and report</td>
<td>40</td>
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<td><strong>Total</strong></td>
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