USP 543: Geographic Applications in Planning
Spring 2018
Dr. Joe Broach

This file will serve as a living syllabus for USP 543. Please check back often as course content is updated.

Basics

Tues/Thurs 2-3:50p
Urban 225 GIS Lab (schedule)
Urban 320-B, Tue 10a-11:30a, Thu 10:30a-12:00p,
or by appointment or discovery
mailto:jbroach@pdx.edu
http://web.pdx.edu/~jbroach/543

Course Concept

This course has not been taught since 2011. While previous editions emphasized geographic theory relevant
to urban places, this somewhat experimental version instead focuses on practical applications of geographic
concepts, analyses, and tools to planning problems. In 2018, geographic analyses in our field are mainly
brought to bear within Geographic Information Systems (GIS), and that is where we will focus.

GIS is increasingly applied to all aspects of urban planning–far too many to cover in 10 weeks! And, even if
we had the time, I couldn’t do justice to the entire set of skills the field encompasses. With those things in in
mind, I treat this as an “emergent” course that tries to optimize the time we have given my knowledge and
your existing skills and interests. To paraphrase statistician George Box, all courses are flawed, but some are
useful.

The content draws heavily from my own experiences with GIS in research and planning and in particular the
following observation:

GIS skill and resources seem to lag behind the complexity of the questions we ask, or want to ask.

This course is for students in planning and related fields who have already had a taste of GIS, or perhaps
even a full serving or two, but find themselves hungry for more. Many will have had their basic training in a
Desktop GIS, most likely ESRI’s ArcMap, and will have mainly done “point and click” GIS analysis and
map making. While that traditional setting is still common in planning, it is not the direction the field is
headed. For that reason, this course is taught in a variety of software settings that emphasizes the dispersion
of techniques, data sources, and applications in planning GIS.

The diligent student will leave the course with a diverse portfolio of GIS work to refer back to,
build on, and to show potential employers.

A useful way to define the field of urban planning is as an interdisciplinary response to city problems:
inequitable access, environmental degradation, public health failures, inefficiencies, just to name a few. Many
urban problems are “wicked” problems without a clear path to a solution, even if resources to tackle them
were unlimited. Building a bridge may seem like a difficult problem, but deciding where to build it, and for
whom, is many times harder.

This course emphasizes the complexity and uniqueness of each urban problem by teaching students
how to design tailored GIS applications, rather than simply running canned software tools.

Despite its complexity in application, the geographic concepts underlying most GIS analysis relevant to
planning are really pretty simple: define and measure a spatial dimension of data, and consider based on one
or more of the following broad analysis types:

- **geometry**: shape/length/area/density
- **pattern**: geographic distribution
overlay: geographic relationship to other types of spatial features

proximity: degree of separation from other features

GIS also plays a key role in planning data collection—both quantitative and qualitative—and display, and we will spend some time on both of these dimensions as well.

Too many great GIS plans end with census data overlays on a stale map.

Tools & Skills

This is an applied course, and students will be introduced to a range of software tools, data types & sources, and analysis techniques. Mirroring the evolution of GIS planning practice, we’ll work in a variety of software environments, each of which with its own particular strengths and limitations. We’ll work with a wide variety of spatial data, and even generate our own. Wicked problems require flexible toolkits. In addition to the familiar ESRI/ArcMap formats, students will become familiar with some or all of the following:

- Desktop GIS: QGIS
- Spatial Databases: PostGIS, SpatiaLite
- GIS Scripting/Programming Languages: Python, PostGIS, ArcMap/QGIS Models
- Data Sources: GeoJSON, OpenStreetMap (OSM), Web Map Services

A tentative list of advanced GIS skills we might apply includes:

- Web map creation
- Dasymetric mapping
- Spatial data masking (jittering)
- Georeferencing
- Network analysis
- GPS data collection & processing
- GIS-based collection & visualization of Qualitative data
- Spatial database setup & spatial queries
- Visual model building
- Basic GIS scripting in Python

Structure

I’ll plan to use about one hour of class time each week to introduce new tools, techniques, concepts, and applications. The remainder will be spent largely as guided lab time for you to learn the tools & skills and apply them to planning problems. I’ll provide some of the problems in the form of challenges. You’ll provide others as you think of ways to apply GIS to your own questions of interest. We’ll also spend some time in seminar-style discussions to share experiences, information, and ideas to solve each others analysis barriers.

This will be a collaborative class. Teaching you just what I know won’t get us far enough. I’ll introduce techniques, help solve problems, and work with you to locate appropriate data and tools when what we have are inadequate.

There will be no exams or assignments with right and wrong answers. Instead, there will be planning problem challenges that each student will approach differently.

The primary outcome of the course will be your accumulation and documentation of applying new techniques to planning problems in portfolio form.

All materials will be made available through the course website.
Deliverables

1. **Challenge responses:** throughout the term, students will be challenged with specific planning problems (e.g. Which public transit lines have the greatest equity value?). You will use these challenges as a chance to practice and learn new techniques. Your response will be in the form of a completed analysis folder that you email to me. You’ll receive feedback, and you may choose to revise and add to your portfolio (see below). Challenge responses will make up 30% of your grade.
   - Challenge #1: Transit equity analysis
   - Challenge #2: Spatio-temporal mapping & web Mapping
   - Challenge #3: Dasymetric Mapping

2. **Portfolio:** the primary product for the term will be a portfolio of GIS analyses you conduct in the course of the class, showcasing your GIS data, problem solving, and visualization skills. The portfolio will be submitted in two forms: as an html document and as a pdf document. Students are encouraged to tailor their portfolio to their own interests and aspirations, but to receive full credit, each portfolio should include:
   - at least THREE separate well-described GIS analyses or sub-analyses, including work in at least TWO separate software environments (e.g. ArcMap, QGIS, R, Python, PostGIS, SpatiaLite). The analyses may be related or separate
   - at least THREE well-crafted maps, figures, or tables based on spatial analysis results
   - at least ONE interactive web map (in the html version)
   - at least ONE example of comparing results from different data sources or analysis methods
   - well-cared for project folder(s) with all data, descriptions, and any custom tools needed to reproduce your results

Portfolios will make up 70% of your grade. I will provide feedback midway through the term and at the end, and I’m happy to help you revise your portfolio or expand the analysis even after the course concludes. More detailed discussion about the portfolios will occur during the course.

Readings

There is no formal textbook. Readings will be provided as required or requested to support concepts, techniques, or applications.

Tentative Schedule

We’ll use this schedule as a rough outline of the course, but it is subject to change based on class interests, new data opportunities, etc.

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<thead>
<tr>
<th>Module</th>
<th>Topics</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>(Re)-introduction to desktop GIS</td>
<td>QGIS for ArcMap users, and vice versa w/ application to basic transit equity analysis</td>
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<tr>
<td>2</td>
<td>Advanced visualization techniques</td>
<td>Cartograms, Spatio-Temporal Mapping, Interactive Web Maps</td>
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<tr>
<td>3</td>
<td>Re-sampling data, Programmatic GIS</td>
<td>Dasymetric mapping, PostGIS</td>
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<tr>
<td>Module</td>
<td>Topics</td>
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<tr>
<td>4</td>
<td>Network analysis</td>
<td>Accessibility mapping, data acquisition w/ Python, and application to transit network data</td>
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<tr>
<td>5</td>
<td>Documenting &amp; sharing maps &amp; analyses</td>
<td>Markdown, basic web page development</td>
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**Boilerplate**

**Academic Accommodations:** If you have a disability and are in need of academic accommodations, please notify one of us immediately to arrange needed support. Please consult https://www.pdx.edu/drc/current-students for more information about university resources.

**Syllabus Disclaimer:** Every effort will be made to keep changes to basic content, learning goals, expectations, and assessment to a minimum.

You are part of a course “reboot” and should expect a more fluid (and participatory) structure than the usual fare.

**Academic Integrity:** Students are expected to be ethical not only in the classroom, but also out of the classroom. It is in all students’ interest to avoid committing acts of academic dishonesty and to discourage others from committing such acts. Academic dishonesty includes, but is not limited to, the following examples: engages in any form of academic deceit; refers to materials or sources or uses devices not authorized by the instructor for use during any quiz or assignment; provides inappropriate aid to another person in connection with any quiz or assignment; engages in Plagiarism. Plagiarism is the act of claiming someone’s work as your own through copying it without giving the creator of the work credit. Plagiarism can also include using another person’s theories, ideas, or phrases without proper attribution. The simplest way to avoid plagiarizing is to always cite the sources from which you gather information or develop arguments – just cite anything you use from someone else. Plagiarism is a serious issue and is a violation of the PSU Student Conduct Code http://www.ess.pdx.edu/OSA/osa_b.htm. University policy requires instructors to report all instances of plagiarism and penalize the perpetrator(s) according to guidelines set. Please talk to us if you ever have any questions about how to cite your work.

**Title IX Reporting Obligations** As instructors, our responsibilities include helping create a safe learning environment for students and for the campus as a whole. Please be aware that we have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment, sexual violence or discrimination with a confidential employee who does not have this reporting responsibility, you can find a list (http://www.pdx.edu/sexual-assault/get-help) of those individuals. For more information about Title IX please complete the required student module Creating a Safe Campus in your D2L.

**resources**

http://web.pdx.edu/~jbroach/543/

**Maps!**

Below is an example of a map that has some cool stuff but doesn’t work well at all as a static map, but as a (web map)...not half bad.
Figure 1: static map of Divvy Bike Share system use, Chicago