

Syllabus for GTECH 73200
GIS Analysis
Fall 2024
Some Tuesdays 5:30 – 8:25 PM

Instructor: Jochen Albrecht
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Classroom: HN 1090B-2
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Goal/Rationale:

Building on the contents of GTECH 709, where emphasis is on capturing geographic relationships in basic data structures, this course extends these to 3-D, network and field representations and their respective analysis functions. The focus of this course is the development of geoprocessing workflows that culminate in the development of a spatial decision support system (SDSS). While most techniques have a geographic origin, we will address all geo-spatially relevant methods, including geophysical, landscape ecological, econometric, epidemiological, and regional science approaches. On the practical side, you will be introduced to five different software packages – with an emphasis on the open-source packages in [OSGeo-Live](#). You will be presented with an augmented Virtual Machine of [OSGeo-Live](#) that you can run on an installation of VirtualBox either in our department labs or on your own computer. You will each conduct an individual semester-long software project that relates to GIS analysis. The choice of software package is up to you. The application area (field) is to be chosen by you and you are responsible for gathering the necessary data.

Learning Outcomes:

At the end of the semester, you should be able to

- perform advanced selection and filtering techniques by space and/or attribute;
- understand the role of spatial relationships in landscape ecological analysis;
- distinguish the effect of data models on the choice of analysis methods;
- engage in spatial database design;
- mimic dynamics inside of GIS;
- distinguish between spatial statistics and spatial analysis;
- handle vague data;
- write simple scripts to automate GIS tasks; and
- develop your own basic spatial decision support system, either stand-alone or as part of a larger application

Textbooks: required: *none*.

Recommended:

- Worboys, M. and M. Duckham 2004. GIS: A Computing Perspective. CRC Press. ISBN 978-0415283755
- O'Sullivan, D. and Unwin, D.J. 2010. Geographic Information Analysis. Hoboken, NJ: Wiley. ISBN 978-0470288573
- de Smith M, Goodchild, M and P Longley 2018. Geospatial Analysis. Leicester: Winchelsea Press. Free access at <http://www.spatialanalysisonline.com/> or as Amazon Kindle ebook (no ISBN)
- Geocomputation with R 2019. <https://bookdown.org/robinlovelace/geocompr/>
- Malczewski & Rinner 2015. [Multicriteria Decision Analysis in Geographic Information Science](#).
- Tzotsos, A 2021. [OSGeo-Live presentation](#).

Pre-requisite: GTECH 70900

Policies:

Attendance is crucial. You will be provided with recordings of all weekly sessions of the Fall semester 2023. You **must** listen to / view them at the beginning of every week. We are striving for an active class-learning environment and the responsibility to keep up with the assignments rests with you. Most of your performance is based on practical assignments rather than tests. Adherence to protocols and the course timetable is of utmost importance. I will be there for you whenever you need me – but the responsibility to reach out whenever you have any questions is yours. Active involvement in the course is evidenced in part by undertaking the mechanics of the practical assignments systematically and learning the tools by hours of practice. In so doing the tools soon come to be seen as a means to an end, rather than the end itself. For example, you will make many maps, and may get caught up in this creative activity, but remember that the maps are being made for particular scientific purposes.

Web-enhancement in the context of this course means that everything pertaining to this course will be communicated through [BlackBoard](#). You are required to check the BlackBoard course site on a daily basis. All changes to the syllabus will be announced on the course home page. All lecture and lab materials are accessible through [BlackBoard](#), and this is also the place where you upload your assignments to. Your exams and lab assignments will be graded based on what you have uploaded to BlackBoard and this is where you will find your grades and may access course statistics that help you to assess your standing at any given time.

All [email messages](#) about this course should include [GTECH 732](#) in the subject line, and be signed with your full name as it appears in CUNYfirst. You are addressing me professionally and I will not answer messages coming from “fun” addresses such as “sweetheart4u” or “slamdunk23”

Hunter College Policy on Academic Integrity. Hunter College regards acts of academic dishonesty (e.g. plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

Hunter College’s Policy on Students with Disabilities. In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical and/ or Learning) consult the Office of AccessABILITY located in Room E1124 to secure necessary academic accommodations. For further information and assistance please call (212- 772- 4857)/TTY (212- 650- 3230).

Hunter College Policy on Sexual Misconduct. In compliance with the CUNY Policy on Sexual Misconduct, Hunter College affirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationship. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College. Sexual Violence: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, on contacting the College’s Public Safety Office (212-772-4444). All Other Forms of Sexual Misconduct: Students are also encouraged to contact the College’s Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry 5 (colleen.barr7@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

Preferred Gender Pronoun. All people have the right to be addressed and referred to in accordance with their personal identity. In this class, we will have the chance to indicate the name that we prefer to be called

and, if we choose, to identify pronouns with which we would like to be addressed. I will do my best to address and refer to all students accordingly and support classmates in doing so as well."

Lab policies are described in detail in <http://www.geo.hunter.cuny.edu/techsupport/rules.html>.

Assignments are due one week after they are given in class. It is in your best interests to keep up with the work and meet deadlines for assignments. Let this be a message to you: *most students failing this course do so because they fell behind with their assignments and did not manage to catch up*. Incomplete grades and time extensions are not an option as I will not be in New York outside of the CUNY lecture period. There are no "extra-credit" assignments.

Syllabus change policy: Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice. All changes will/would be announced on [BlackBoard](#), which you are expected to check on a daily basis.

Criteria for evaluation:

Evaluation of academic performance is based on your lab exercises, your software project and your participation according to the following breakdown:

Lab exercises	45%
Midterm exam	15%
Project	40%

Numeric scores will be used throughout the semester. The course letter grade will be determined only at the end of the semester, although guidance as to letter grade standing will be given along the way.

Most lab exercises are designed for an 8-hour period (with the exception of one, which is likely to take you 20 hours). You are free to work with them at your own leisure either in our computer labs, in your home department, or in your private home. You can use our computer labs at any time outside of the posted instruction times for other courses. Again: it is your responsibility to manage your time to conduct both the labs as well as project work during the hours that the lab room is accessible. Of course, you are free to work at home as much as you want – the OSGeo-Live virtual machine gives you unlimited freedom in that respect.

Each student conducts an individual semester-long software project that involves the development of a spatial decision support system to deal with a non-trivial geospatial problem. There are no requirements with respect to what software you use. In a similar vein, the application area (field) is to be chosen by you, and you are responsible for gathering the necessary data. Basically, you can choose whatever topic you want, provided it has to do with *geographical analysis*; the stress is on both words! It is your responsibility to find a suitable project, which will have to be accepted by the instructor. A few ready-made projects are available, but experience shows that motivation increases when students take pride in their own project.

I will not accommodate students who are late in their work or do not show up for the final exam. And, unless you produce a medical certificate or letter from the [Office of AccessABILITY](#), I will not give the final grade of IN (incomplete).

Course Calendar:

We will work based on a weekly schedule with each week starting on a Tuesday (except when it is a CUNY holiday). Special dates are:

- 09/10, project proposal due
- 10/22, project update report due
- 10/29, midterm exam
- 12/20, final project due

Schedule:

Week #	Date	Topic
1	09/03	Introduction; SDSS demonstration; project management
2	09/10	Intro to OSGeo-Live
3	09/17	Advanced overlay analysis
4	09/24	Pattern and cluster analysis
5	10/01	Advanced raster analysis and Intro to GRASS
6	10/08	Intro to SAGA and spatial decision support
	10/15	CUNY Monday – no GTECH 732
7	10/22	Network analysis
8	10/29	Midterm and 3d surface analysis
Week #	Date	Topic
9	11/05	Spatial interpolation
10	11/12	Model builders
11	11/19	Basic Python and geospatial APIs
12	11/26	Spatial databases and queries
13	12/03	PostGIS and pgRouting
14	12/10	Geospatial web services
15	12/17	Project presentations

It is the student's responsibility to regularly check the course website to become aware of changes to the schedule or other announcements.

Teaching Philosophy & Approach

Hunter College...

This is a place where students come to learn. It's a place where knowledge is developed and hopefully it's a place where students can see and participate in its development. Unlike previous schooling you don't *have to* be here, so we'll assume that *you want to be here* and that you are here to *actively* seek knowledge and skills.

With the assumption that you are (a) here of your own free will and (b) are actively seeking to gain knowledge and skills, there is only one fuzzy area (for some) - how to succeed! It's really quite simple: have fun. If you are enjoying what you are doing, you will succeed; if you are taking subjects or studying in a particular program and not enjoying it, you are unlikely to be successful.

A few words on success and enjoyment. Success is not just measured by your grade (but passing does help!), it is also measured by how you feel about what you are doing. You are the only person who can really judge whether you are successful - have you met your own expectations? Enjoyment does not necessarily mean stress free living (although maybe it is for some!). Taking only subjects that you were told were "easy" doesn't guarantee enjoyment; some of us require a challenge in life! Again, only you are in a position to determine what you find enjoyable.

A final thought on what a university is: this is also a place where faculty comes to learn...

GTECH 732 Advanced GeoInformatics

Students: to be successful you should be taking this subject because you want to take it, not because someone told you that you need to take it and you must be actively seeking knowledge and skills. This subject is a good participation "sport", but it's not a really good spectator event. **You need to be proactive**, be able to try

something new, look at things from a new (spatial) perspective, ask questions, read, read, read. You need to know when to take a break, get some fresh air, rest your eyes (a Buddhist philosophy is quite useful...). Make sure that you are not falling behind. When your absence is unavoidable, make sure you catch up on what was missed. Plan your week as best as possible and make the commitment to spend the amount of time needed for you to be successful. Get a study partner or three, if this works for you.

Faculty: to be successful, I need to know that I've "made a difference" to at least some of my students, i.e., they feel successful. I'll provide a coherent subject structure, I'll deliver the best lecture possible on the day, and pointers to resources where possible and my tutors and I will provide sound practical instruction and practice our listening skills so that we can understand what difficulties you may be having, so that we can resolve them. Furthermore, I am available and approachable. Ask questions whenever they arise. Use the BB Discussion Board or email me; if none of these resolves the issue, make an appointment to meet with me on Zoom or in person.

The faculty often lecture in subjects we are considered to have some expertise in; we are therefore fairly interested in the subject matter. We too are students in that we continue to learn new things in our areas of expertise and sometimes we are the ones who develop new knowledge in our areas of expertise!

Theory vs. practice: In lectures I try to provide an overview of the most important knowledge, but this never replaces the reading material. Sometimes lectures and readings will cover the same ground, but often, the best that can be done in some fourteen sessions is to provide just a "flavor" of the subject matter, something to whet your appetite, something to set the context for your readings.

Finally...

The reason for this page of amateur pop psychology is twofold: (a) first I hope that prospective students take this subject for the right reasons (i.e., they believe that they will enjoy it) and are in the right frame of mind to be successful and (b) second, I hope that with a little mutual empathy the learning experience can be made better for both student and teacher. If we are not having fun, we are both doing something wrong!

I wish us a lot of fun in this course,

A handwritten signature in cursive script, appearing to read "John".