
GIS 4121 (Geospatial Analysis)/GIS 6116 (GIS Analysis)

1. OVERVIEW

GIS analysis involves the process of analyzing and identifying patterns in geographic data and describing relationships between spatial features and phenomena. This course introduces various techniques for the analysis of spatial data and will be comprised of lectures and computer labs. Lecture topics include geographic distributions, pattern identification within spatial data, analysis of field data, spatial modeling and interpolation, regression methods, and cluster analysis. On the practical side, students will conduct spatial analysis with GIS software including ArcGIS Pro, Python scripting, and model builder, as well as with Microsoft Excel spreadsheet functions.

- Spring semester, 3 credits
- 100% online, synchronous and asynchronous component
- <http://elearning.ufl.edu/>

Recommended course Prerequisites: GIS3072C or any other introductory GIS course. In general, some working experience with ArcGIS or ArcGIS Pro is recommended. Basics in statistics are essential, so is competence with MS Excel software.

Instructors:

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Please use the Canvas conversation system for fastest response. Virtual office hours on Zoom can be arranged by appointment.

Lectures:

Links to pre-recorded lectures and other lecture materials will be posted in weekly modules on the course Web site

Required reading materials:

- O'Sullivan D, Unwin DJ (2010). *Geographic Information Analysis* (2nd ed.). Hoboken, New Jersey, Wiley & Sons
- Additional references to books, book chapters, and online resources will be given during the lecture

Further recommended reading materials:

- de Smith, M. J., Goodchild, M. F., and Longley, P. A. (2018). *Geospatial Analysis (6th ed.)*: Winchelsea Press. Available online at <http://www.spatialanalysisonline.com/>
- Rogerson, P. and Yamada, I. (2009). *Statistical Detection and Surveillance of Geographic Clusters*. Boca Raton, FL: CRC Press.
- Short instructional videos closely related the lecture content can be found at the [Geomatics @ FLREC YouTube channel](#)

Software requirements:

- ArcGIS Pro 2.4 and Microsoft Excel will be used for many topics taught in this course. If unfamiliar with this software, it is recommended to run through practice tutorials beforehand.
- ArcGIS Pro download and installation instructions are provided on the course website under the Week 1 module.
- Additional free software packages used (e.g. CrimeStat) will be introduced in corresponding course modules.

2. LEARNING OUTCOMES

The course objective is to provide students with the following competencies at the completion of the course:

1. Use spatial statistics to identify geographic patterns
2. Apply GIS analysis methods on vector and raster data to answer spatial research questions
3. Describe field data through Geostatistical analysis functions
4. Automate and customize geoprocessing functionality through Python scripting and ModelBuilder
5. Apply critical thinking skills in GIS and communicate content in written format

3. COURSE LOGISTICS

- Throughout the semester, the students will be given 8 home assignments, 3 quizzes, and approximately 4 discussion items. For each assignment, quiz, and discussion item a due date and time is given, which is usually a week after the handout.
- Assignments are graded based on timeliness, correctness of computations and interpretation of numerical results, creativity and technical versatility with written feedback by the instructor; quizzes are auto-graded based on correctness of multiple choice questions with correct answers shown after completion, and discussion items are graded within a week based on creativity, completeness, technical correctness and the number of comments provided to peers.
- There is a 1-week turnaround for assignment and discussion grading. Quizzes are autograded instantaneously in Canvas.
- Undergraduate and graduate students will receive different home assignments reflecting different levels of complexity.
- This course is a distance education course and taught based on pre-recorded lectures which can be downloaded from weekly modules on the Canvas website.

The Canvas system should be used as the primary platform for written communication between students and the instructor. Questions and suggestions to the class can also be posted under the Discussions tab. Any short-term changes concerning lectures or other course components will be announced through Canvas. Feel free to contact the instructors with any questions.

Technology Requirements:

- A computer or mobile device with high-speed internet connection and a headset and/or microphone and speakers to view lectures and join Q&A sessions.
- ArcGIS Pro runs only on Microsoft operating systems. If students use a Mac computer or other operating systems, they are encouraged to use ArcGIS Pro in UF Apps (<https://info.apps.ufl.edu/>).
- For Zoom: A supported web browser on a supported operating system (Windows, Mac OS, Linux); and minimum bandwidth. More details can be found [here](#).

Using Zoom:

Occasional, informal Q&A sessions (after announcement), or office hour meetings (per individual student requests) will be conducted with Zoom web conferencing software. Zoom sessions can be joined by clicking a link provided on the course Web site or through Canvas e-mail.

Grades:

<i>Item</i>	<i>Percentage</i>
Home assignments	80%
Quizzes	12%
Online discussions	8%
Total	100%

Grading scale:

<i>Grade</i>	<i>Percentage</i>	<i>Grade</i>	<i>Percentage</i>
A	92.0-100.0	C+	78.0-79.9
A-	90.0-91.9	C	72.0-77.9
B+	88.0-89.9	C-	70.0-71.9
B	82.0-87.9	D	60.0-69.9
B-	80.0-81.9	E	0-59.9

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

COURSE CONTENT

Week	Topic	Readings
Week 1, Jan 8 (H)	Course introduction, review concepts of statistics and distributions, matrix notation	O'Sullivan (2002) Appendix A
Week 2, Jan 15 (H)	Statistics review (cont.)	
Week 3, Jan 22 (H)	Spatial processes, Quadrat count methods	O'Sullivan ch 4.1-4.4, p. 121-130
Week 4, Jan 29 (H)	Distance based point pattern measures (NN, F, G, L functions)	O'Sullivan p. 130-155
Week 5, Feb 5 (H)	Cluster detection based on attribute values; spatial autocorrelation, hot-spot analysis	O'Sullivan ch 7, ch.8.1-8.4
Week 6, Feb 12 (H)	Geographically Weighted Regression (GWR); autoregressive models	O'Sullivan ch 8.5 de Smith ch. 5.6
Week 7, Feb 19 (H)	Location based cluster detection (hierarchical, K-means)	CrimeStat IV manual ch. 7-16, 7-36, 8-20
Week 8, Feb 26 (A)	Analyzing geographic relationships, multivariate statistical analysis	O'Sullivan ch 11.1 and 11.2
<i>Week 9, Mar 4</i>	<i>Spring Break</i>	
Week 10, Mar 11 (A)	Dimensionality Reduction: Multi-dimensional Scaling - Principal Components Analysis (PCA)	O'Sullivan ch 11.4-11.6
Week 11, Mar 18 (A)	Spatial interpolation: deterministic and stochastic models, IDW, kriging, and linear regression	O'Sullivan ch 8, 2.4
Week 12, Mar 25 (A)	Analysis of field data, Surface modeling, TIN and raster	O'Sullivan ch 9
Week 13, Apr 1 (A)	Map overlays (raster, vector) - Raster data analysis	O'Sullivan ch 11 <i>Online book (Map Analysis): Topic 22</i>
Week 14, Apr 8 (A)	Raster data analysis (cont.) - neighborhood, zonal, global functions – Raster Analysis Applications	<i>Online book (Map Analysis): Topic 23</i>
Week 15, Apr 15 (A)	Automating geoprocessing through Python script	Handouts: ESRI white papers and documentations
Week 16, Apr 22 (A)	Raster Analysis Applications (cont.)	

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5. POLICIES AND REQUIREMENTS

This syllabus represents current plans and objectives for this course. As the semester progresses, changes may need to be made to accommodate timing, logistics, or to enhance learning. Such changes, communicated clearly, are not unusual and should be expected.

Late submissions and make-up requests:

It is the responsibility of the student to access on-line lectures, readings, quizzes, and assignments to maintain

satisfactory progress in the course.

- A 10% penalty per day will be applied to late assignments. A late submission on the due date results also in a 10% deduction.
- Assignments will not be accepted if handed in more than seven days after the due date.
- Quizzes cannot be taken past the deadline.
- Online discussions cannot be completed past the deadline.
- Exceptions to the late policy are only allowed per university policy.

Computer or other hardware failures, except failure of the UF canvas system, will not excuse students for missing assignments. Any late submissions due to technical issues **MUST** be accompanied by the ticket number received from the Helpdesk when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request consideration.

For computer, software compatibility, or access problems call the HELP DESK phone number—352-392-HELP = 352-392-4357 (option 2).

Semester Evaluation Process:

Student assessment of instruction is an important part of efforts to improve teaching and learning.

At approximately the mid-point of the semester, the School of Forest Resources & Conservation will request anonymous feedback on student satisfaction on various aspects of this course. These surveys will be sent out through Canvas and are not required but encouraged. This is not the UF Faculty Evaluation!

At the end of the semester, students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

Netiquette: Communication Courtesy Semester Evaluation Process:

All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats, as laid out in the [UF Netiquette Guide](#) for Online Courses. . Failure to do so may result in loss of participation points and/or referral to the Dean of Students' Office.

Academic Honesty Policy:

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*"

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*"

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct or

appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated.

Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>
View [this video](#) for more information on how to avoid plagiarism.

University Policy on Accommodating Students with Disabilities:

Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive; therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

Software use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

6. GETTING HELP

For issues with technical difficulties for canvas in Canvas, please post your question to the Technical Help Discussion in your course, or contact the UF Help Desk at:

- Learning-support@ufl.edu | (352) 392-HELP - select option 2 | <http://elearning.ufl.edu>
- Library Help Desk support <http://cms.uflib.ufl.edu/ask>
- SFRC Academic Hub <https://ufl.instructure.com/courses/303721>

For any other questions related to the course, please do not hesitate to contact the instructor or teaching assistant. Each home assignment will be accompanied by a discussion board on Canvas where students can discuss questions on given assignment tasks with each other.

Student Life, Wellness, and Counseling Help:

- Counseling and Wellness resources <http://www.counseling.ufl.edu/cwc/>
- U Matter, We Care <http://www.umatter.ufl.edu/>
- Career Resource Center <http://www.crc.ufl.edu/>
- Other resources are available at <http://www.distance.ufl.edu/getting-help> for online students

Student Complaint Process:

The School of Forest Resources & Conservation cares about your experience and we will make every effort to address course concerns. We request that all of our online students complete a course satisfaction survey each semester, which is a time for you to voice your thoughts on how your course is being delivered.

If you have a more urgent concern, your first point of contact should be the SFRC Academic Coordinator or the Graduate/Undergraduate Coordinator for the program offering the course. You may also submit a complaint directly to UF administration at <http://www.distance.ufl.edu/student-complaint-process>