Biology 3050/5050: "Spatial Analysis"

Instructor: Corey Devin Anderson, Ph.D. (Preferred salutation: "Dr. Anderson")

Lecture location: Bailey Science Center, Room 1202
Day and time: TR 2:00 to 3:15 PM

Lab location: Bailey Science Center, Room 3018
Day and time: M 2:00 to 4:50 PM
Final Exam/Last unit exam: Wednesday, 06 May (2:45-4:45 PM)

Office: 1208 Bailey Science Center
Office Hours: Wed 9:30 to 11:30 AM
Email: coreanderson@valdosta.edu

Course description:
'A survey of key concepts and statistical methods for the statistical analysis of spatial data, designed for environmental and life sciences but open to all relevant disciplines.'

- This course was designed to complement existing courses in Geographic Information Systems (GIS) and biostatistics, which do not cover the statistical analysis of spatially dependent data.

- Some overlap exists between the present course and GEOG 4710 (Statistics for Geoscientists); however, the purview of the present course extends beyond geostatistics.

- The lecture part of the course explores the basic theory and concepts underlying the various statistical methods/models, supplemented by examples from the scientific literature and outside readings from a textbook.

- The laboratory part of the course is intended to extend and reinforce the methods presented in lecture by providing hands on experience and assistance with data acquisition and analysis, including statistical programming (in R).

Standards
Education outcomes for BA/BS Degree in Biology: 1
VSU General Education Outcomes: 3, 4, 5, & 7

*Topics covered:
- Introduction to spatial processes and patterns.
- Data structures, coordinate systems, and map projections.
- Review of parametric and nonparametric statistics.
- Spatial variance, covariance, and autocorrelation.
- Geostatistical data analysis.
    - Spatial autocorrelation coefficients and correlograms.
    - Variography and interpolation.
- Modeling and removing autocorrelation.
    - Spatial regression.
- Nonstationarity and local spatial statistics.
- Anisotropy analysis.
- Contiguous unit analysis.
- Point pattern analysis.

*Emphasis on particular topics may vary from semester.

Books

Required text:
- *Spatial Analysis A Guide for Ecologists* (Second Edition) by Mark R. T. Dale and Marie-Josee Fortin; the publisher is Cambridge University Press.

Recommended text:
- *Data Analysis in Ecology and Agriculture using R* by Richard E. Plant; the publisher is CRC Press.

Computing

Access to a PC with a Windows operating system is recommended for this course. The software we are using also works on Apple Macintosh computers (and Linux operating systems). For Mac users, a very basic introduction to using the software on Mac will be provided.

You will need to download the following freeware:
- R (v 3.6.2); update as required
    - https://cran.r-project.org/bin/windows/base/

This and other software required for the course will be available in the Biology Computing Center (BSC 3018).

Grading

Grades will be determined using a stack-rank system. In other words, students will be evaluated based on how well they perform *relative* to other students in the class. The median score in the class represents the "low B"/"high C". I then use natural breaks in the point distribution to determine other letter grades. In the case that discrete natural breaks in the distribution do not exist, I will use quartiles of the distribution, where the first quartile contains the non-passing grades ("D" and "F") and the median score between the third quartile and the highest score is the cutoff for the "A".

There are a total of ~700 points that can be earned in this course: 300 points from lecture exams, 300 points from problem sets, 50 points from 'pop' coding quizzes and 50 points for attendance.

- The unit exams are worth 100 points each. The third unit exam will be on the date of the final.
- There will be five problem sets (worth 60 points each). Late problem sets will be docked 5 points/day.
- There will be approximately five 'pop' R-coding quizzes; each quiz will be worth 10 points. This are intended to evaluate you progress with R and to serve as a basis for class discussion.
- I will randomly sample attendance 10 times; each time you are present you will receive 5 points (for a possible total of 50 points).

Cheating and Plagiarism policy

Do not cheat on an exam. You will receive a zero on the exam and will be reported to the Office of Student Affairs.

DO NOT copy problem sets from other students! If your problem set too closely resembles more than one other student in the class, you will get a zero.

I am particularly sensitive about students copying computer (R) code. It is OK to use the internet to find useful functions and strategies, but you should never lift large swaths of code from the internet or other students (especially if you are asked to write a novel function).

Cell phone and computer policy

Please turn your cell/smart phones phones off (or on silent) when you enter the classroom. I am OK with students using a laptop computer in class as long as it is for course material in Spatial Analysis (and not other 'work').

When in the computer lab, you should use the provided computers (and not your own laptop). You are encouraged to use your own computer for assignments outside of formal class time.

Cell/smart phones are strictly prohibited during exams; any student who has a cell/smart phone out during an exam will receive a zero on that exam. Make sure you bring a calculator to exams.

Students with disabilities

Students requiring classroom or testing accommodations because of documented disabilities should discuss their needs with the instructor at the beginning of the semester. Special arrangements should be made via the Access Office, located in Farbar Hall. The phone numbers are 229-245-2498 (V), 229-375-5871 (VP) and 229-219-1348 (TTY). For more information, please visit VSU's Access Office or email: access@valdosta.edu.

Title IX statement

Valdosta State University (VSU) is committed to creating a diverse and inclusive work and learning environment free from discrimination and harassment. VSU is dedicated to creating an environment where all campus members feel valued, respected, and included. Valdosta State University prohibits discrimination on the basis of race, color, ethnicity, national origin, sex (including pregnancy status, sexual harassment and sexual violence), sexual orientation, gender identity, religion, age, national origin, disability, genetic information, or veteran status, in the University's programs and activities as required by applicable laws and regulations such as Title IX. The individual designated with responsibility for coordination of compliance efforts and receipt of inquiries concerning nondiscrimination policies is the University's Title IX Coordinator: Maggie Viverette, Director of the Office of Social Equity, titleix@valdsota.edu, 1208 N. Patterson St., Valdosta State University, Valdosta, Georgia 31608, 229-333-5463.