GEOG 316/PLAN 351 – Multivariate Statistics

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Office Hours: TBD

COURSE DESCRIPTION
Specialists in the environmental sciences (e.g. geography, hydrology, ecology, atmospheric science) have to deal with a wide range of data. Multivariate statistical techniques are particularly well suited for analyzing many types of data (variables) simultaneously. This course will provide students with a foundation in the fundamentals of multivariate analysis, and practical experience of applying those techniques to problems in the environmental sciences.

COURSE LEARNING OBJECTIVES
By the end of the course students will be able to:
• Identify the most appropriate multivariate statistical techniques to use for data analysis in their academic discipline.
• Discriminate between the most common multivariate statistical techniques used in the environmental sciences.
• Apply these techniques to real data using the statistical software package SPSS.
• Interpret the output from SPSS and communicate the results of these techniques.
• Have the confidence to explore beyond the techniques explored in this course.

PREREQUISITES
ENVS 278 (Advanced Environmental Research Methods). It is assumed that students are comfortable with mathematics and have basic knowledge of introductory statistics.

TEXTBOOK
There is no required textbook for this course. The following four textbooks will be placed on reserve at the Dana Porter Library as general references:


COURSE WEBSITE
Students registered in the course can access the course website via UW Learn (http://www.learn.uwaterloo.ca). The course website provides access to lecture presentations as well as lab assignments (and associated data). In addition, the course website supports announcements, discussion groups and e-mail. Please use the UW Learn e-mail for messages related to this course.

CLASS MEETINGS
Lecture section
Wednesday: 13:00-14:20 (Room: PAS 1241)

Tutorial (lab) sections
Thursday: 8:30-9:50 (Room: EV1 240)
Thursday: 10:00-11:20 (Room: EV1 240)

STUDENT ASSESSMENT
Lab assignments (4): 40%
Readings report: 20%
Midterm exam: 15%
Final exam (closed-book): 25%

Lab Assignments
- Lab assignments are to be completed during the tutorial sessions and in your own time in teams of two students. Students need to upload their assignment individually to UW Learn. Both assignments will receive exactly the same mark.
- Lab assignments will take the form of 4-5 pages research reports (excluding title page, figures and tables). They will include sections of introduction, data and methods, results and discussion, conclusion, and references.
- Access to the computer lab is restricted by code to those enrolled in particular courses including this one. Food and/or drink are NOT permitted in the lab.
- Students are expected to make use of the on-line help for SPSS whenever necessary. SPSS is the statistical software package that will be used to complete the lab assignments.
- Students are 100% responsible for maintaining backups of any files and data you have modified. In computing the mantra is: if it’s not in two places it doesn’t exist. Suitable options for backups include: portable USB flash drives; external hard drives; laptops, or home desktop PCs; online “cloud” storage. No accommodation will be made for assignments handed in late due to lost or corrupted data.

Readings Report
- Students will read six research papers of their choice (two of each related to the use of either multiple linear regression, logistic regression, principal component analysis, classification techniques, and time series analysis) and summarize these in 12-18 pages (double spaced; 2-3 pages per paper).
- For each research paper read, a summary will be prepared that provides a concise overview of the paper (area of application, objectives of the study), what data and precise statistical methods/techniques were used, what results were obtained, and a brief critique of the paper (this is optional – based on your level of understanding; i.e. merit of the work, things that unclear or not addressed).
• Do not copy sections of the abstracts or use phrases directly from the papers to prepare your summaries. When I read your summaries I want to see that you personally understood the key points of the papers.

**Midterm Exam**
The midterm exam will cover all materials covered from Week 1 to Week 5. It will take place during the first half (45 minutes) of Week 6 class.

**Final Exam**
The final exam will cover all course materials (Week 1 to Week 12). It will take place during the on-campus exam period in December.

**SUBMITTING WORK**
Unless otherwise noted, all work should be submitted on UW Learn in PDF format. Please do not submit work in any format other than PDF (e.g., SPSS, Microsoft Word, Excel). Each assignment will have a specified due date and time on UW Learn.

**LATE SUBMISSION**
Failure to submit your work on time will result in a grade of zero for that assignment. Late work will not be accepted under any circumstances without official documentation; for example, a University Illness verification form.

**WEEKLY CLASS SCHEDULE**

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ILLNESS DURING TERM
Please refer to the University of Waterloo Policies regarding documentation and the management of requests for accommodation due to illness during the term. Illness verification forms are required for any student seeking accommodation for any course requirement missed due to an illness. Please refer to http://www.registrar.uwaterloo.ca/students/accom_illness.html for more information.

ACCOMMODATIONS DUE TO ILLNESS

Missed due dates: If an assignment due date is missed because of illness, and all of the proper documentation is submitted on time, the weight of the remaining assignments or tests will be increased accordingly. Assignment due dates will not be extended. For example, if you miss one of the 4 labs, the remaining 3 labs will make up 50% of your final grade.

Final examination: If the final exam is missed due to illness and all of the proper documentation is submitted on time, a deferred final examination will be written the next time that this course is taught.

POLICY ON REGRADING ASSIGNMENTS
If you notice an error in the assessment of your work please follow these steps:
1. Wait 72 hours after the assignment was returned before requesting a regrade.
2. All regrade requests must be formally submitted in writing to the instructor, describing the errors you believe were made. Be as specific as possible and list all relevant details, e.g., “my marks were summed incorrectly for questions 1–5”.
3. If another student’s assignment is used as an example or reason for an error in grading, both assignments must be submitted for a regrade.
4. The entire assignment will be regraded, not just the errors indicated in the written request. The resulting grade may increase or decrease depending on the result of the regrading.

ATTENDANCE
Attendance will not be taken at any lectures. However, it is suggested that students attend all scheduled lectures since much of the material covered in class will be applied in the lab assignments.

POLICY ON E-MAIL CORRESPONDENCE
Students should rarely need to send e-mail to the instructor or TA because most information required is available elsewhere: e.g., in this course outline, on UW Learn, in the textbooks, or at office hours. However, if your question or concern cannot wait until the next lecture then please remember these policies when sending e-mail:
• Always send e-mails from your University of Waterloo e-mail account.
• All e-mails should have the following subject line: “GEOG316: <<insert your message here>>”.
• If your e-mail includes an attachment, describe the contents of the attachment in the e-mail.
• Be polite, respectful and professional.
• Proofread your e-mail and use correct grammar and punctuation.
• Always use an appropriate greeting, and sign your full name.
• Allow the instructor or TA at least two business days to respond before sending the request again. Mark all urgent matters “URGENT” in the subject line.
• The instructor or TA reserves the right to reply to you along with the entire class if the question is deemed to be relevant to other students on the course.

UW POLICIES

♦ **Academic Integrity**: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [www.uwaterloo.ca/academicintegrity](http://www.uwaterloo.ca/academicintegrity/)

♦ Students who are unsure what constitutes an academic offence are requested to visit the online tutorial at [http://www.lib.uwaterloo.ca/ait/](http://www.lib.uwaterloo.ca/ait/)

♦ **Research Ethics**: Please also note that the University of Waterloo requires all research conducted by its students, staff, and faculty which involves humans as participants to undergo prior ethics review and clearance through the Director, Office of Human Research and Animal Care (Office). The ethics review and clearance processes are intended to ensure that projects comply with the Office’s Guidelines for Research with Human Participants (Guidelines) as well as those of provincial and federal agencies, and that the safety, rights and welfare of participants are adequately protected. The Guidelines inform researchers about ethical issues and procedures which are of concern when conducting research with humans (e.g. confidentiality, risks and benefits, informed consent process, etc.). If the development of your research proposal consists of research that involves humans as participants, the please contact the course instructor for guidance and see [http://iris.uwaterloo.ca/ethics/](http://iris.uwaterloo.ca/ethics/)

♦ **Note for students with disabilities**: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.

♦ **Religious Observances**: Student needs to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

♦ **Grievance**: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read **Policy 70 - Student Petitions and Grievances**, Section 4, [www.adm.uwaterloo.ca/Infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/Infosec/Policies/policy70.htm). When in doubt please contact your Undergraduate Advisor for details.

♦ **Discipline**: A student is expected to know what constitutes academic integrity, to avoid committing academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g. plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, [www.adm.uwaterloo.ca/Infosec/Policies/policy71.htm](http://www.adm.uwaterloo.ca/Infosec/Policies/policy71.htm). For typical penalties, check [Guidelines for Assessment of Penalties, www.adm.uwaterloo.ca/Infosec/guidelines/penaltyguidelines.htm](http://www.adm.uwaterloo.ca/Infosec/guidelines/penaltyguidelines.htm)
Appeals: A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 – (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm)

Turnitin: Plagiarism detection software (Turnitin) may be used to screen assignments on this course. This is being done to verify use of all material and sources in assignments is documented. In the first lecture of the Term, details will be provided about the arrangements for the use of Turnitin. NOTE: Students may request an alternative to Turnitin, which is to prepare an annotated bibliography for each assignment. For advice on how to prepare an annotated bibliography, see: [http://www.lib.sfu.ca/help/writing/annotated](http://www.lib.sfu.ca/help/writing/annotated).

For further information on UW’s Turnitin guidelines, see: [http://uwaterloo.ca/academic-integrity/home/guidelines-instructors](http://uwaterloo.ca/academic-integrity/home/guidelines-instructors)

LEARN: Users can login to LEARN via:
- [http://learn.uwaterloo.ca/](http://learn.uwaterloo.ca/)
  - use your WatIAM/Quest username and password

Documentation is available at: [http://av.uwaterloo.ca/uwace/training_documentation/index.html](http://av.uwaterloo.ca/uwace/training_documentation/index.html)