Multiple Regression in Educational Research

EDUC 610 – 3 Credits – CRN 17258
University of Oregon – College of Education

2018 FALL Term Syllabus
Meeting Days/Time: Tuesdays 4:00-6:50pm
Location: Lokey 276

INSTRUCTOR	
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DESCRIPTION

The goal of the course is to learn how to apply and use multiple regression in educational research. Topics covered include multiple regression with continuous and categorical independent variables, regression diagnostics, and interactions. Additional topics include inference based on simulation, contrasting inferential analyses with predictive analyses, and visualization of data/regression models. Computer analysis, conceptual understanding, and applications to educational research are stressed.

LEARNING OUTCOMES

In this course, you will:

a. Become knowledgeable about multiple regression.
b. Learn to conduct and interpret multiple regression analyses.
c. Become a critical consumer of approaches to multiple predictor analyses.
d. Become acquainted with advanced topics in multiple regression.

COURSE PREREQUISITES

An introductory course in statistics (e.g., EDUC 614) is required. We will primarily rely on the free and open-source computing software R. **Prior to the first class** please download R (https://cran.r-project.org) and RStudio (https://www.rstudio.com/products/rstudio/download/). Once these are installed, launch RStudio and copy and paste the following code into the console, and press `enter/return`.

```
install.packages(c("tidyverse", "arm", "rio"))
rio::install_formats()
```

During the install phase, you will likely get some messages asking you if you'd like to install from source. You can go ahead and try to do this, but if you have any errors, just re-run the first line again, but decline. We will likely install additional packages as the course proceeds. **If you have installation issues** please contact the instructor prior to the start of the first class. Ideally everyone will have at least this much done prior to the first class.

If you have no prior experience with R, do not worry. We have partnered with DataCamp for this course, which includes hundreds of hours of instructional videos on a variety of topics using R. **Prior to the start of the first class, it is recommended at all students** complete the *Introduction to the tidyverse* course, available here: https://www.datacamp.com/courses/introduction-to-the-tidyverse. This is not required and will not count toward your grade, but will help you be prepared to take the class using R. Students wanting additional instruction prior to class should also complete the *Introduction to R* course (https://www.datacamp.com/courses/free-introduction-to-r). If you need additional support with R, please get in touch with the instructor.

READING MATERIALS (all provided by instructor)

TITLE	AUTHOR(S)	Abbreviation
Multiple regression in behavioral research (3rd Ed.). • Chapters 2, 5, 11, 3, 13-14, 7	Pedhazur, E. J.	P
Data analysis using regression and multilevel/hierarchical models • Chapters 3, 8, and 9	Gelman, A. & Hill, J.	GH
Introduction to Economics with R *https://www.econometrics-with-r.org*	Hanck, C., Arnold, G., & Schmelzer, M.	Hanck et al
Modern Dive: An introduction to statistical and data sciences via R	Ismay, C. & Kim, A. Y.	MD
An introduction to statistical learning with applications in R • *Chapter 1*	James, G., Witten, D., Hastie, T., & Tibshirani, R.	JWHT
Publication manual of the American Psychological Association (6th Ed.).	APA	

DataCamp Courses

Our DataCamp website is located at: https://www.datacamp.com/enterprise/multiple-regression-for-educational-research

TITLE	AUTHOR(S)	Abbreviation	Link
Correlation and Regression	Baumer, B.	DC: B1	https://www.datacamp.com/courses/correlation-and-regression
Multiple and Logistic Regression	Baumer, B.	DC: B2	https://www.datacamp.com/courses/multiple-and-logistic-regression
Inference for Linear Regression	Hardin, J.	DC: H	https://www.datacamp.com/courses/inference-for-linear-regression
Supervised Learning in R: Regression	Zumel, N. & Mount, J.	DC: ZM	https://www.datacamp.com/courses/supervised-learning-in-r-regression
Statistical Modeling in R (Part 2)	Kaplan, D.	DC: Kap	https://www.datacamp.com/courses/statistical-modeling-in-r-part-2
Modeling with Data in the Tidyverse	Kim, A. Y.	DC: Kim	https://www.datacamp.com/courses/modeling-with-data-in-the-tidyverse

COURSE STRUCTURE

Course meetings will consist of a combination of lectures, question and answer, group discussion, and in-class lab work. In-class lab work, exercises, and a take-home final are required, as well as regular participation and discussion in class. Attendance at all classes is strongly encouraged. Students are responsible for content covered in any missed classes. If you require special arrangements for any class activities or assignments, please contact the instructor as soon as possible.

WEEKLY SCHEDULE OF TOPICS AND ASSIGNMENTS

WEEK	TOPIC	READ BEFORE CLASS	ASSIGNMENTS	
			Assigned	Due
1 Sep 25	Review of simple linear regression and correlation concepts	P: Ch 2 MD: Ch 6.1	DC: B1, Ch 1-4 *Optional* • DC B1, Ch 5 • DC: Kim, ○ Ch1-2	
2 Oct 2	Multiple regression with continuous variables	P: Ch 5 MD: Ch 7.1	DC: B2 (Ch 1, 3) *Optional* • DC: Kim, Ch 3	DC: B1, Ch 1-4
3 Oct 9	Multiple regression with categorical predictors	P: Ch 11 MD: Ch 7.2.1-7.2.2	**Coding Exercise**	DC: B2 (Ch 1, 3)
4 Oct 16	Uncertainty and tests of significance	Hanck et al: 5.1-5.3	DC: H, Ch 4	
5 Oct 23	Model assumptions and Diagnostics	P: Ch 3	**Diagnostics Exercise**	DC: H, Ch 4 **Coding Exercise**
6 Oct 30	Partial and semipartial correlations	P: Ch 7	**Partial/Semipartial Exercise**	
7 Nov 6	Curvilinear and Interaction effects	P: Chs 13-14 (skim) MD: Ch 7.2.3	DC: B2, Ch 2 DC: Kap, Ch 1 **Interactions Exercise**	**Diagnostics Exercise**
8 Nov 13	Multimodel inference & coefficient interpretation	P: Ch 10 Burnham & Anderson (2004)	**Model compare Exercise** DC: Kim, Ch 4 *Optional* DC: Kim Ch 1-3	DC: B2, Ch 2 DC: Kap, Ch 1 **Partial/Semipartial Exercise**
9 Nov 20	Prediction	Shmueli (2010) JWHT: Ch 1	DC: ZM, Ch 1-2 **Final Project**	DC: Kim, Ch 4 **Interactions Exercise**
10 Nov 27	Simulation for inference	GH: Ch 7-8 MD: Ch 11 Optional: • MD: Ch 8-10	DC: H, Ch 1-2	DC: ZM, Ch 1-2 **Model compare Exercise**
11 Dec 4	EXAM WEEK			DC: H, Ch 1-2 **Final Project**

Note: The pace at which we cover the material may be adapted as the class progresses. Should you feel yourself falling behind the material, please ask questions in class, visit office hours, work with your classmates, and schedule additional appointments with the instructor as necessary. Additional readings may be added throughout the term at the discretion of the instructor.

COURSE WEBSITE

We will use Canvas as the main course website. All materials for the course, including slides, datasets, readings, etc., will be available on Canvas.

GRADING POLICY, COMPONENTS, AND CRITERIA

Your final grade for this course will be determined based on the following course activities and assignments:

- DataCamp: 5 points each = 70 points (22%)
- In-Class Labs: 5 points each = 50 points (16%)
- Exercises: 5 at 20 points each = 100 points (31%)
- Final Project: 100 points (31%)

Total: 350 points

Your final grade will be based on the weighted sum of the percentages earned for each course activity/assignment. Each component is described in greater detail below. Final letter grades for the course will be calculated as follows:

A+	97-100%	A	93-96.9%	A-	90-92.9%
B+	87-89.9%	B	83-86.9%	B-	80-82.9%
C+	77-79.9%	C	73-76.9%	C-	70-72.9%
D+	67-69.9%	D	63-66.9%	D-	60-62.9%
		F	< 59.9%		

Please note that if this class is taken P/NP, 80% or higher is required to pass the class.

Note that regular attendance is assumed and will be gauged via labs.

Any and all requests for review of a given grade must be taken up outside of class (i.e., not before, during, or after class); instead, make use of office hours and email.

Late work will be penalized a minimum of 10%. Work is due at the beginning of the class on the due date (whether or not you are present in class). Any instance of academic dishonesty (e.g., plagiarism, disallowed collaboration) will result in a score of zero for the assignment. Collaboration is allowed on labs, and exercises, but all work the final paper should be your own independent work.

IN-CLASS LAB WORK AND PARTICIPATION

Throughout the quarter, students are expected to work **individually or in groups** to practice assignments and techniques in running and interpreting analyses (this will usually be during the last part of the class session). Therefore, one or more students in a group **must have a laptop with R and RStudio installed**. This work will be guided by an assigned exercise and discussion questions. In addition, students are encouraged to **ask questions when they do not understand content**. There are **no bad questions**.

Lab work must be turned in electronically on Canvas. Although you may work in groups for the labs, all students must turn in a lab assignment. **Lab work and participation** make up 16% of your grade and **are graded pass/fail only. Labs are due at the end of class**.

EXERCISES

The purpose of the exercises is to provide you with independent practice in fundamental activities used in multiple regression analyses. There will be 5 exercises during the quarter. Each will be **available on Canvas one week before they are due**.

Exercises may be completed individually or in collaboration with other students. However, the team working on the exercise should be clear, and all members should turn in their own document to Canvas. Exercises are **due at the beginning of class on the announced due date**.

Exercises:

- Must be turned into canvas before class the day they are due;
- Are reviewed in class the same day they are due;
- Are graded pass/fail;
- Have no time limit; and
- Are always **due at the beginning of class on the announced due date**.

Model answers will be reviewed and discussed in class on the exercise due date, so **exercises cannot be made up nor can extensions be offered**. Exercises are worth 31% of your overall grade.

You will receive *full credit for an earnest attempt at completing the exercise in full*, but sloppy or incomplete work will receive reduced credit. During the review, students will annotate their assignments based on the model answers. Exercises will be returned to students with instructor feedback at the following class.

NOTE: The exercises in this course may differ substantially from those you have completed for other courses. They require 2-3 hours and function as a support of your mastery of both the mechanics of statistical analyses and the concepts covered in class. *It is generally a good idea to start working on each exercise within 48 hours of class so that the requisite ideas are still fresh, and you have adequate time to complete the exercise.*

FINAL

The purpose of the final is to provide you with extended experience in using, reporting, and interpreting multiple regression. The final will build on one of the exercises you complete during the term. The final assignment will be **distributed two weeks before it is due**. Papers must be completed independently, and **must include your R code** either as an appendix or through an R Markdown document. **Up to 10 points extra credit will be awarded for using R Markdown.**

The final is **due on Tuesday, December 4th before midnight and should be uploaded to Canvas**. The final is worth 25% of your grade.

The final is graded, and you will receive detailed, individualized feedback.

NOTE: The final in this course may differ substantially from those you have completed for other courses. **You are asked not only to conduct analyses and report results**

but to interpret them and provide rationale for your interpretations. It is a good idea to start working on the final as soon as it is available so that you have adequate time to complete it.

EXTENSIONS

Our class is traditionally a large one. As such, granting individual extensions is a rare occurrence.

No extensions for exercises are allowed, although in rare circumstances, students may be provided with an alternate activity. Alternates will be provided only in cases of unforeseeable and dire circumstances (e.g., severe illness, family emergency).

Extensions for the final will be granted in cases of unforeseeable and dire circumstances (e.g., severe illness, family emergency). Note that travel and poor time management are not considered dire circumstances. Late finals that have not been granted an extension *will* incur a minimum late penalty deduction of 10% of the maximum grade.

STUDENT ENGAGMENT INVENTORY - GRADUATE		
Educational activity	**Hrs student engaged**	**Explanatory comments(if any):**
Lecture	30	
Assigned Reading/DataCamp	30	
Quizzes (Exams Taken Outside Class)	10	Completed online
Problem Sets or Exercises	20	
Writing Assignment	30	Final paper
Total hours:	120	

ATTENDANCE AND ABSENCE GUIDELINES

Attendance is required to succeed in this course and master the course material. If a student does miss class, it is the student's responsibility to get class notes, and handouts or other distributed materials. Students must contact the instructor in case of illness or emergencies that preclude attending class sessions. Messages can be e-mailed at any time of the day or night, prior to class. If no prior arrangements have been made before class time, the absence will be unexcused. On a case-by-case basis, the instructor will determine whether the emergency qualifies as an excused absence.

OFFICE HOURS

Office hours are held weekly on Wednesday from 10am to 12pm in 175 Lokey Education. Additional office hours can be requested at any time. Office hours are set drop-in times.

Attending office hours on a regular basis is strongly recommended. It is acceptable to bring work in progress to office hours and to work on assignments during office hours. Although answers will not be given, the instructor will give hands-on guidance and feedback. Students are also encouraged to practice analyses learned in class on data of their own (or their advisor's) during office hours.

EXPECTED CLASSROOM BEHAVIOR

Classroom expectations include:

- Participate actively in class activities.
- Respect the diversity of cultures, opinions, viewpoints in the classroom.
- Listen to fellow students, professors, and lecturers with respect.
- Arrive on time, prepared for class.
- Attend for the duration of class.
- Return from breaks in a timely manner.
- Do not read other materials, books, or newspapers.
- Do not use laptops for email, surfing, or other activities unrelated to class.
- Turn off cell phones and other electronic devices.
- Racist, homophobic, sexist, and other disrespectful comments will not be tolerated.

Eating during class is allowed, but please try to keep noise and mess to a minimum. Food waste should be disposed of **outside the classroom**. **If you open a window or door, it is your responsibility to close it when class is over.**

DIVERSITY, EQUITY, AND INCLUSION

It is the policy of the University of Oregon to support and value equity and diversity and to provide inclusive learning environments for all students. To do so requires that we:

- respect the dignity and essential worth of all individuals.
- promote a culture of respect throughout the University community.
- respect the privacy, property, and freedom of others.
- reject bigotry, discrimination, violence, or intimidation of any kind.
- practice personal and academic integrity and expect it from others.
- promote the diversity of opinions, ideas and backgrounds which is the lifeblood of the university.

In this course, class discussions, projects/activities and assignments will challenge students to think critically about and be sensitive to the influence, and intersections, of race, ethnicity, nationality, language, religion, gender, socioeconomic background, physical and cognitive ability, sexual orientation, and other cultural identities and experiences. Students will be encouraged to develop or expand their respect and understanding of such differences.

Maintaining an inclusive classroom environment where all students feel able to talk about their cultural identities and experiences, ideas, beliefs, and values will not only be my responsibility, but the responsibility of each class member as well. Behavior that disregards or diminishes another student will not be permitted for any reason. This means that no racist, ableist, transphobic, xenophobic, chauvinistic or otherwise derogatory comments will be allowed. It also means that students must pay attention and listen respectfully to each other's comments.

DOCUMENTED DISABILITY

Appropriate accommodations will be provided for students with documented disabilities. If you have a documented disability and require accommodation, arrange to meet with the course instructor within the first two weeks of the term. The documentation of your disability must come in writing from the Accessible Education Center in the Office of Academic Advising and Student Services. Disabilities may include (but are not limited to) neurological impairment, orthopedic impairment, traumatic brain injury, visual impairment, chronic medical

conditions, emotional/psychological disabilities, hearing impairment, and learning disabilities. For more information on Accessible Education Center, please see http://aec.uoregon.edu

MANDADORY REPORTING OF CHILD ABUSE
UO employees, including faculty, staff, and GEs, are mandatory reporters of child abuse. This statement is to advise you that that your disclosure of information about child abuse to a UO employee may trigger the UO employee's duty to report that information to the designated authorities. Please refer to the following links for detailed information about mandatory reporting:
http://hr.uoregon.edu/policies-leaves/general-information/mandatory-reporting-child-abuse-and-neglect

REPORTING TITLE IX EXPERIENCES
Any student who has experienced sexual assault, relationship violence, sex or gender-based bullying, stalking, and/or sexual harassment may seek resources and help at safe.uoregon.edu. To get help by phone, a student can also call either the UO's 24-hour hotline at 541-346-7244 [SAFE], or the non-confidential Title IX Coordinator at 541-346-8136. From the SAFE website, students may also connect to Callisto, a confidential, third-party reporting site that is not a part of the university.

Students experiencing any other form of prohibited discrimination or harassment can find information at respect.uoregon.edu or aaeo.uoregon.edu or contact the non-confidential AAEO office at 541-346-3123 or the Dean of Students Office at 541-346-3216 for help. As UO policy has different reporting requirements based on the nature of the reported harassment or discrimination, additional information about reporting requirements for discrimination or harassment unrelated to sexual assault, relationship violence, sex or gender based bullying, stalking, and/or sexual harassment is available at http://aaeo.uoregon.edu/content/discrimination-harassment

Specific details about confidentiality of information and reporting obligations of employees can be found at https://titleix.uoregon.edu.

The instructor of this class will direct students who disclose sexual harassment or sexual violence to resources that can help and has the responsibility to report the information shared with them to the university administration. The instructor of this class is required to report all other forms of prohibited discrimination or harassment to the university administration.

I. ACADEMIC MISCONDUCT
All students are subject to the regulations stipulated in the UO Student Conduct Code http://conduct.uoregon.edu). This code represents a compilation of important regulations, policies, and procedures pertaining to student life. It is intended to inform students of their rights and responsibilities during their association with this institution, and to provide general guidance for enforcing those regulations and policies essential to the educational and research missions of the University.

CONFLICT RESOLUTION
Several options, both informal and formal, are available to resolve conflicts for students who believe they have been subjected to or have witnessed bias, unfairness, or other improper treatment.

It is important to exhaust the administrative remedies available to you including discussing

the conflict with the specific individual, contacting the Department Head, or within the College of Education, you can contact the Associate Dean for Academic Affairs and Equity (Krista Chronister, 346-2415, kmg@uoregon.edu). Outside the College, you can contact:

- UO Bias Response Team: 346-3216 http://bias.uoregon.edu/whatbrt.htm
- Conflict Resolution Services 346-3216 http://studentlife.uoregon.edu/support
- Affirmative Action and Equal Opportunity: 346-3123 http://aaeo.uoregon.edu/

GRIEVANCES

A student or group of students of the College of Education may appeal decisions or actions pertaining to admissions, programs, evaluation of performance and program retention and completion. Students who decide to file a grievance should follow the student grievance procedure, or alternative ways to file a grievance outlined in the Student Grievance Policy (https://education.uoregon.edu/academics/student-grievance) or enter search: student grievance.

INCLEMENT WEATHER

In the event the University operates on a curtailed schedule or closes, UO media relations will notify the Eugene-Springfield area radio and television stations as quickly as possible. In addition, a notice regarding the university's schedule will be posted on the UO main home page (in the "News" section) at http://www.uoregon.edu. Additional information is available at http://hr.uoregon.edu/policy/weather.html.

If an individual class must be canceled due to inclement weather, illness, or other reason, a notice will be posted on Canvas or via email. During periods of inclement weather, please check Canvas and your email rather than contact department personnel. Due to unsafe travel conditions, departmental staff may be limited and unable to handle the volume of calls from you and others.

INCOMPLETE COURSE POLICY

Students are expected to be familiar with university policy regarding grades of "incomplete" and the time line for completion. For details on the policy and procedures regarding incompletes, Please see: https://education.uoregon.edu/academics/incompletes-courses

GRADUATE EMPLOYEES (GE) IN GRADUATE LEVEL COURSES

If you are concurrently taking any courses with the GE assigned to this course, please let the instructor know. The GE will not be involved with any review of assignments for students in this course who are taking other courses concurrently.