STA 7233

Spring 2026

Advanced Regression

Instructor: Joseph Antonelli
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Office hours: Tuesdays 1:45pm – 2:45pm and Thursdays 12:40pm – 1:40pm in Griffin-Floyd Hall 206.

Course Website: e-Learning

Course Prerequisites: A well prepared student should have taken advanced courses in generalized linear models, matrix algebra, theoretical statistics, and should be comfortable with the R programming language.

Course lectures: Tuesdays from 10:40am to 11:30am and Thursdays from 9:35am to 11:30am in Griffin-Floyd Hall 100.

Course Notes/Material: Notes for each class should be posted by the end of the previous day on the course website. These should contain nearly all of the material that we cover in class, however, I will present some additional material in the lectures that is not posted on the course website.

Software: We will be using the R software language throughout. R is free and should be easy to download on your personal computer. I also highly recommend running R through RStudio, though it is not a requirement. If you have any problems downloading R or RStudio, feel free to come talk to me. If you do not have access to a computer, please reach out to me via email.

Required Text: There isn't a required textbook, but the following books will be useful, particularly The Elements of Statistical Learning, as much of our material is covered there.

- Hastie, Trevor, et al. The elements of statistical learning: data mining, inference, and prediction. Vol. 2. New York: springer, 2009.

- Hastie, Trevor, Robert Tibshirani, and Martin Wainwright. Statistical learning with sparsity: the lasso and generalizations. CRC press, 2015.

- Ruppert, David, Matt P. Wand, and Raymond J. Carroll. Semiparametric regression. No. 12. Cambridge university press, 2003.

Course Description and Objectives: The course covers a variety of advanced methods used in modern regression analyses. The major topics covered in the course will be (in no particular order) semiparametric regression techniques (e.g., local linear regression, splines), regularized/shrinkage estimators (e.g., ridge regression and lasso), advanced statistical machine learning methods (e.g., tree-based methods, support vector machines, neural networks), deep learning, and more. The course culminates in a final project, which could include novel methodological research, an in-depth numerical or theoretical examination of a method covered in class, a novel data analysis project, or similar.

Homework

There will be 2-3 homework assignments given out over the course of the semester.

Exams

You will have one in-class exam that will take place approximately around the midpoint of the semester.

Project: Students will be expected to complete a written project at the end of the semester and present their findings to the class. Ideally, this project will complement your current research, or allow you to learn more about a topic from the course (or course-adjacent) which particularly interests you. Projects can be methodological, numerical, or applied, e.g., you could apply a method from the course to a new dataset; you could perform extensive simulation studies comparing methods from the course, etc.

Grade Distribution

Homework	10%
Midterm	50%
Project	40%

Letter Grade Assignment: Grades will be assigned as follows: 90-100, A; 87-89.9, A-; 84-86.9, B+; 80-83.9, B; 77- 79.9, B-; 74-76.9, C+; 70-73.9, C; 67-69.9, C-; 64-66.9, D+; 60-63.9, D; 55-59.9, D-; 0- 55, F

Make up Policy: Requirements for class attendance and make-up exams, assignments, and other work in this course as well as policies regarding absences, religious holidays, illness and student athletes are consistent with UF Attendance Policies (https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/)

Dropping and Withdraw

For late course drops and course withdrawals please visit https://catalog.ufl.edu/UGRD/academic-regulations/dropping-courses-withdrawals/

Incomplete

An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which the student has completed a major portion of the course with a passing grade, been unable to complete course requirements before the end of the term because of extenuating circumstances, and obtained agreement from the instructor and arranged for resolution of the incomplete grade in the next term. Instructors are not required to assign incomplete grades. For complete details please visit CLAS incomplete grade policies and forms.
(https://www.advising.ufl.edu/academicinfo/clas-policiesprocedures/incomplete-grades/)

Accommodating Students with Disabilities

Students requesting accommodation for disabilities must first register with the Dean of Students Office. The Dean of Students will provide documentation to the students who must then provide this documentation to the instructor when requesting information. You must submit this documentation prior to submitting any assignments for which you are requesting accommodation.

Academic Misconduct: Students are held accountable to the UF Honor Code.
(https://sccr.dso.ufl.edu/process/student-conduct-code/)

Evaluations: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at
https://evaluations.ufl.edu/results/.

Additional resources: Any additional resources including academic support or information technology can be found at https://www.ufl.edu/about/offices-services/

Approximate weekly breakdown of the material:

Week	Topic
1	OLS, ridge regression
2	Lasso
3	Lasso
4	Inference for high-dimensional linear models
5	PCA and partial least squares
6	Polynomials and splines
7	Kernels, nearest neighbor regression
8	Discriminant analysis
9	Support vector machines
10	Generalized additive models
11	Tree-based methods
12	BART, Boosting
13	Ensemble learning

14	Neural networks and deep learning
15	Project presentations