

**Math 410A, Winter 2020**  
**Advanced Statistical Methods**

**Instructor:** Dr. Dominic Klyve

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**Office Hours:** Monday 9–10, Tuesday 11–12, Thursday 9–10, Friday 11–12, and by appointment

**Meeting times:**

Tuesday, Wednesday, Friday, 11:00 – 12:00 in Samuelson 245

Thursday, 11:00 – 12:00 in Samuelson 138 (unless otherwise announced)

**Course Goals and Description:** This course is the second of a two-part sequence designed to cover beginning and intermediate regression, ANOVA, classification, and machine learning. We will learn the theory behind these models, and we will spend a lot of time using them to answer questions about real-world data. We will also begin to explore methods in predictive analytics, including classification methods, random trees, and random forests. Additional topics will likely include: linear regression, multiple regression, logistic regression, ANOVA, two-way ANOVA, bootstrapping, permutation methods, Principal Component Analysis, random trees and random forests, and time series analysis.

The first half of the course (410A) will include a lot of advanced details about linear regression (including inferential statistics), multiple regression, logistic regression, linear discriminant analysis, k-nearest neighbors methods, and ANOVA, along with an introduction to R.

The second half (410B) will cover non-parametric procedures, resampling methods (including the bootstrap and permutation tests), ridge regression and the lasso, time series analysis, tree-based classification methods (including bagging and boosting), Principal Components Analysis, Time Series Analysis, and (time-permitting) clustering methods. The second half of the course will include significant project in which you will perform an analysis of a real-world dataset, and a public speaking component, for which we will spend time discussing and practicing the art and science of presenting statistics in public.

**Required Text:** Gareth James, et al. *An Introduction to Statistical Learning with Applications in R*, Springer.

**Evaluation and Grading:** Grades will consist of four components: (almost) weekly labs (20%), homework (10%), two midterm exams (20% each), and a large quarter-long project (30%) in which you will complete and write about a significant statistical analysis of your own or with your team.

Grades will be assigned according to the following scale:

		A	93-100%	A-	90-92.99%
B+	87-89.99%	B	83-86.99%	B-	80-82.99%
C+	77-79.99%	C	73-76.99%	C-	70-72.99%
D+	67-69.99%	D	63-66.99%	D-	60-62.99%
		F	59.99% and below		

## Details concerning course components

### “R skills” labs

The course will feature two or three labs which introduce you to, and let you practice, sets of specific advanced skills in R.

Each of these labs will contain a short introduction, a reference to one or more resources for mastering the technique, and a set of challenges for you to complete.

### Homework

A small amount of homework will be assigned from the book most weeks. These are designed to let you practice the basics of the new statistics we are covering, and the corresponding techniques in R. Homework will generally not be collected.

### Midterm Exams

There will be two take-home mid-term exams, given roughly during Week 5 and Week 9. During this time you may use any sources you like except for other people.

**General Course Policies:** Come to class. Do your own work. Work really hard; this class is likely to be quite difficult, but you will leave it with a useful set of skills, and a better understanding of statistics!

Students with disabilities who wish to set up academic adjustments in this class should give me a copy of their "Confirmation of Eligibility for Academic Adjustments" from the Center for Disability Services as soon as possible so we can discuss how the approved adjustments will be implemented in class. Students without this form should contact the Center for Disability Services, Bouillon 205 or dsrecept@cwu.edu or 963-2171.

I reserve the right to change the policies contained in this syllabus as dictated by developments during the quarter.