STAT 451: Sports Statistics and Analytics II

Basic Course Information

Course Name: STAT 451: Sports Statistics and Analytics II

Semester: Spring 2026

Credits: 3

Prerequisites/Co-requisites: None

Meetings/Times: Monday/Wednesday 2:00 – 3:15pm

Location: Weber 223H

Instructor Information

Instructor Name: Dr. Aaron Nielsen

Email: Aaron.Nielsen@colostate.edu

Office Location: 220 Statistics

Teaching Assistants: Kai Jeffreys (kai.jeffreys@colostate.edu)

Office Hours/Student Hours: By appointment

Communication Policy:

Homework questions are best answered in person, so if you have a homework question, chat with me before/after class or in office hours.

If you have logistical/organizational questions about class, feel free to email me. I will do my best to respond to your emails within 72 hours

Course Materials

Textbook / Course Readings

No required textbook. Course materials will be posted on Canvas.

Materials & Equipment

Most projects will include a data analysis using R. Python is optional.

Course Description & Objectives

Introduction to data collection, data management, data visualization, statistical and machine learning methods related to exploratory and predictive analysis of sports data. Real world examples from baseball, football, basketball, hockey, soccer, and volleyball are covered.
Upon successful completion of this course, students will be able to:

1. Acquire sports data using data scraping techniques and R packages.
2. Create graphical and statistical summaries of sports data.
3. Apply linear regression models, as they relate to sports data and assess model diagnostics.
4. Use principal component analysis for exploratory and data reduction applications
5. Implement machine learning algorithms to analyze sports data (e.g., clustering and classification).
6. Learn sport-specific methods in baseball, football, basketball, hockey, and soccer.
7. Write summary and project reports and present research results to an audience.

Course Schedule

The following schedule of course materials covered is tentative, but the dates of the exams will not change.

Week	DATE	TOPIC/SUB-TOPIC
1	January 19, 2026	Syllabus, Introductions, Expectations
2	January 26, 2026	Data Visualization
3	February 2, 2026	Data Scraping
4	February 9, 2026	Linear Regression
5	February 16, 2026	Advanced Regression
6	February 23, 2026	Advanced Regression
7	March 2, 2026	Logistic Regression
8	March 9, 2026	Logistic Regression
	March 16, 2026	SPRING BREAK
9	March 23, 2026	Principal Component Analysis
10	March 30, 2026	Classification
11	April 6, 2026	Classification
12	April 13, 2026	Clustering
13	April 20, 2026	Draft Analysis
14	April 27, 2026	Selected topics
15	May 4, 2026	Project presentations
Finals	May 11, 2026	Final project report due

Course Policies and Grading

- **Homework**: There will be about six to eight homework assignments and they will be due approximately every other week.

- **Attendance and Participation**: Attendance will be taken at the beginning of every class period. Students are expected to attend class and participate in group discussions.

- **Weekly reading assignments**: There will be a reading assignment approximately once per week. Students will be expected to read the week's paper, complete a reading assignment on Canvas, and discuss the paper in class with classmates. Use of ChatGPT is not permitted on these reading assignments.

- **Exam***: There will be one in-person exam which will be in-class on Wednesday, April 15.

- **Short presentation:** Each student will give a short 2–5 minute presentation on a topic related to Sports Analytics of their choosing.

- **Final project:** Students will complete a final project related to sports statistics either individually or in a small group. Students will be expected to deliver an in-class presentation during the final week of classes and turn in a 5–10 page report.

- **Incompletes**: Incomplete grades follow university policy and are only granted in documented emergencies where remaining work can be completed the following semester. Otherwise, the grade converts to an F.

- **Changes to the Syllabus**: The instructor reserves the right to make changes to the syllabus during the semester. Any updates will be announced in class and on Canvas.

Grading

Grades are based on homework, quizzes, exams, and the final exam. Homework is graded on both correctness. Collaboration is allowed on homework, but all exams must be completed independently.

ASSIGNMENT	GRADE PERCENTAGE
Class Attendance and Participation	10%
Homework Assignments	20%
Reading Assignments	10%
Short presentation	5%
Final Paper	20%
Final Report	20%
Final Exam	15%
Total:	**100%**

GRADE	PERCENTAGE	GRADE	PERCENTAGE
A	93 – 100%	C+	77 – 80%
A-	90 – 93%	C	70 – 77%
B+	87 – 90%	D	60 – 70%
B	83 – 87%	F	0 – 60%
B-	80 – 83%		

Teaching Philosophy

- I believe that every student in this course is capable of learning statistics and applying it meaningfully.
- Learning is a collaborative process, and I encourage questions, discussion, and active engagement.
- My role as instructor is to provide clear explanations, practical examples, and support as you work through challenging material.
- I aim to connect statistical concepts to real-world applications so that students can see their value beyond the classroom.
- I am always available to talk about strategies for learning the material more effectively or to point you toward additional resources.
- My goal is for each student to leave the course with confidence in their ability to understand and use statistics.
- If you experience hardship or need access to campus resources, please feel free to reach out so we can find ways to support your success.

Classroom Norms (or Community Agreement)

- Be respectful of your classmates and the learning environment.

- Avoid distractions during class (e.g., phones, side conversations, unrelated computer use).

- Feel free to ask questions at any time — chances are others are wondering the same thing.

- Listen when others are speaking and allow space for everyone to contribute.

- Come prepared and ready to engage with the material.

- Help create a supportive environment where we all work together to learn.

Additional Syllabus Information and Policies