Stat 381:
Sports Statistics and Analytics I

Fall 2022

Instructor:	Aaron Nielsen	**Email:**	aaron.nielsen@colostate.edu
Time:	MW 4:30 – 5:45pm	**Location:**	Wagar 132
Webpage:	`http://canvas.colostate.edu/`		

Course Coordinator: Dr. Aaron Nielsen, aaron.nielsen@colostate.edu

Course format: This semester's course will be held **in-person**. Class attendance is required.

Course credits: 3

Recommended Textbooks: *Analytic Methods in Sports* (Second Edition) by Thomas Severini and *Mathletics* (Second Edition) by Winston, Netstler, Pelechrinis

Required Software: R (It's free and available at `http://www.r-project.org/`) and RStudio (also free and available at `https://rstudio.com/`).

Office Hours: Immediately after class or by appointment

Prerequisite: Stat 158 and STAT 301/307/315 (or permission from the instructor)

Course Overview: Introduction to sports statistics and the unique aspects of sports data. Applications of sports analytics using exploratory data analysis and vizualizations with tidyverse and ggplot, probability and simulation, confidence intervals and hypothesis testing, resampling methods, linear regression

Course Goals:

0. Reinforce and build on statistical skills from introductory statistics.
1. Analyze the unique aspects of sports data and modeling sports data.
2. Complete Exploratory Data Analysis and generate summary statistics as they relate to sports data.
3. Apply concepts from Probability Theory to model sports data with an emphasis on simulation.
4. Utilize concepts from Statistical Inference, including hypothesis tests and confidence intervals, to make inferential and predictive statements regarding sports data.
5. Apply and interpret linear regression models to explore relationships in sports data.
6. Write summary and project reports related to a final research project.
7. Present final research project to an audience.

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

Exams: There will be two in-person exams.

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 report.

Basis for Final Grade: Your final grade will be based on your exam scores, weekly homework sets, and intangibles such as class participation. The intangibles can only increase your grade. The weightings will be as follows:

- Homework: 30%
- Exam 1: 15%
- Exam 2: 15%
- Final Project Presentation: 15%
- Final Project Report: 15%
- Class attendance and participation: 10%

Grading Scale: Your course grade will be determined from the following grading scale:

A	93% – 100%	C+	75% – 80%
A-	90% – 93%	C	70% – 75%
B+	87% – 90%	D	60% – 70%
B	83% – 87%	F	0% – 60%
B-	80% – 83%		

Course Policies:

- **Academic Integrity and CSU Honor Pledge:** This course will adhere to the CSU Academic Integrity/Misconduct policy as found in the General Catalog and the Student Conduct Code. Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, I will ask that you affirm the CSU Honor Pledge as part of completing your work in this course. Further information about Academic Integrity is available at CSU's Academic Integrity - Student Resources.

- **Cheating:** This includes using unauthorized sources of information and providing or receiving unauthorized assistance on any form of academic work or engaging in any behavior specifically prohibited by the faculty member. In particular, students are not allowed to communicate with others during exams and are not allowed to use online solutions from any source.

- **Late Work Policy:** Online homework may be submitted up to one week late for half credit. No late homework can be submitted after the final exam.

- **Grades of "Incompletes":** I will follow university procedures on "incompletes", i.e., they are only given in situations where unexpected emergencies prevent students from completing the course and the remaining work can be easily finished the following semester. Incomplete work must be finished the next semester or the grade automatically turns into an F.

- **Group Work Policy:** Students are welcome to work together on homework, but note that some WebAssign problems will have different numbers from student to student. You may not use solutions obtained from previous semesters or from online. This is considered academic dishonesty.

- **Students with Disabilities:** The university is committed to providing support for students with disabilities. If you have an accommodation plan, please see me so we can make any arrangements necessary to facilitate your learning.

- **Need Help?** CSU is a community that cares for you. If you are struggling with drugs or alcohol and/or experiencing depression, anxiety, overwhelming stress or thoughts of hurting yourself or others please know there is help available. Counseling Services has trained professionals who can help. Contact 970-491-6053 or go to `http://health.colostate.edu`. If you are concerned about a friend or peer, tell someone by calling 970-491-1350 to discuss your concerns with a professional who can discreetly connect the distressed individual with the proper resources (`http://safety.colostate.edu/tell-someone.aspx`). Rams take care of Rams. Reach out and ask for help if you or someone you know is having a difficult time.

- **COVID:** For the latest information about the University's COVID resources and information, please visit the CSU COVID-19 site `https://covid.colostate.edu/`.

Course schedule: The following schedule of course materials covered is tentative and subject to change.

Week	Topics	References
1	Intro to sports statistics, unique challenges, types of data	Scorecasting, Moneyball
2 – 3	Exploratory Data Analysis, coding in R using tidyverse, vizualizations using ggplot	Analytic Methods (chapter 2)
4 – 5	Probability, axioms, random variables, expected values, analysis of gambling odds, implied probabilities	Analytic Methods (chapter 3)
6 – 7	Simulation and probabilistic modeling of sports data, probability estimation for rare events, streak simulations	Analytic Methods (chapter 3)
8 – 9	Statistical Inference, confidence intervals, hypothesis testing, permutation tests, bootstrap and resampling methods	Analytic Methods (chapter 4)
10 – 11	Quantifying statistical relationships, Pearson correlation, rank correlation, autocorrelation, association of categorical variables	Analytic Methods (chapter 5)
12 – 14	Simple and multiple linear regression, logistic regression, variable selection, issues with multiyear data	Analytic Mehtods (chapters 6,7)
15	Project presentations	