ST495, Fall 2022, Sports Analytics

Instructor: Jason A. Osborne (jaosborn@ncsu.edu)
5214 SAS Hall
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Grader: Zhen Chen (zchen47@ncsu.edu)

Lecture: Tue,Th 10:15 am - 11:30 am, 334 Daniels (111 Lampe Drive)

Textbooks: *Analytic Methods in Sports, Second Edition*,
Thomas A. Severini, 2018, Taylor & Francis Group, LLC

Analyzing Baseball Data with R, Second Edition, M. Marchi
J. Albert and B. Baumer, 2019, CRC Press

Textbooks available for rent through the All-In digital textbook program. See moodle page.

Lecture notes: On pdfs (available on moodle) and on whiteboard in lecture

Computing: Statistical software will be demonstrated with coding examples provided in lecture/on moodle. Introductory experience with SAS or R is required.

Policies of the instructor

Attendance: Attendance and participation in class discussions are encouraged, but will not factor into grading. To the extent that equipment allows it, lectures will be recorded and be made available through the moodle course page.

Graded Coursework:

- Homework: Six assignments which count, in total, 40% of the semester grade. Submit online as pdf, plain text or scanned images. First homework due Thursday, Sept 1.
- A midterm exam (40%), Thursday, Oct. 6.
- A project (20%) related to a journal article (Nov 17, 22, Dec 1):
  - 15-20 minute presentation of the article, in teams of one, two or three students
  - (optional) A separate simulation or computational study related to the article.

Grades assigned by percentage of total possible points according to the following table.

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
98-100	93-97	90-92	88-89	83-87	80-82	78-79	73-77	70-72	68-69	63-67	60-62	< 60

Exams: There will be one **midterm** exam. The signature of an honor pledge will be required. No make-up exams are permitted without verifiable documentation of a medical excuse. The course project at the end of the semester will serve as the final course assessment. (There is no in-class final exam.)
Course description next page.

Course Description Statistical reasoning in sports. Quantitative methods for analyzing observational data collected in pro/amateur sports Understanding limits of inferences that can be made in the setting of sporting events, where experimental control is not possible. Probability concepts, such as joint probability, conditional probability, total probability and Bayes' Theorem to model uncertainty in sports. Quantifying variation in estimation for comparative purposes including resampling techniques; statistical significance. Linear and generalized linear regression models with fixed effects. Focus on professional baseball, basketball, North American footbal, hockey and other sports that are more internationally popular such as tennis and soccer.

- Describing and summarizing sports data
- Probability
  - Modelling events in sports with random variables
  - Probability distributions
  - Conditional probability, The Law of Total Probability, Bayes' Theorem
  - Win probabilities
  - NFL Field Goal success probabilities.
- Statistical Methods
  - Quantifiying variation in sports
  - Calculation margin of error
  - Using simulation and resampling to measure variation of more complicated statistics
  - Comparisons of teams or players
  - Understanding statistical significance
  - Margin of error and adjusted statisticsd
- Correlation
  - The Pythagorean theorem and prediction
  - Spearman correlation for nonlinear association
  - ERA and left-on-base average in baseball
  - How is Nadal better on Clay?
- Multiple Linear Regression
  - Limitations: the shelf-life of NFL coaches example.
  - Modelling Strikeout rate using velocity and movement.
  - Interaction effects
  - Categorical predictors
  - Logistic regression
- Obtaining data from the web
  - Web scraping with SAS and R.
- Miscellaneous presentations from the instructor/guest speakers ***
- Student presentations, Nov 17, Nov 22, Dec 1

Other Policies

Academic Integrity: Academic misconduct, such as cheating on exams, will not be tolerated. Looking at somebody else's paper during an exam is a form of cheating, and will be reported to the Office of Student Conduct (919-515-2963) if observed. See the NCSU policy at this link: http://policies.ncsu.edu/policy/pol-11-35-01

Electronically-Hosted Course Components: Guest speakers from industry will make occasional presentations using Zoom.

Accommodations for Disabilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office at Suite 2221, Student Health Center, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see this link: Academic Accommodations for Students with Disabilities Regulation (REG02.20.01)

Non-Discrimination Policy It is the policy of the State of North Carolina to provide equality of opportunity in education and employment for all students and employees. Educational and employment decisions should be based on factors that are germane to academic abilities or job performance. North Carolina State University ("NC State") strives to build and maintain an environment that supports and rewards individuals on the basis of relevant factors such as ability, merit and performance. Accordingly, NC State engages in equal opportunity and affirmative action efforts, and prohibits discrimination, harassment, and retaliation, as defined by this policy.

Note: The instructor reserves the right to make any changes he considers academically advisable. Such changes, if any, will be announced in class. Please note that it is your responsibility to attend class and keep track of the proceedings.

N.C. State University Polices, Regulations, and Rules (PRR)
Students are responsible for reviewing the PRRs which pertain to their course rights and responsibilities. These include: (Equal Opportunity and Non-Discrimination Policy Statement), (Office for Institutional Equity and Diversity), (Code of Student Conduct), and (Grades and Grade Point Average).