



INSTRUCTOR CONTACT INFORMATION

Instructor: Scott Powers

Office: Kraft 246

Email: scott.powers@rice.edu

Office Hours: I am often available 2:00–2:50 p.m. Mon or 12:30–2:15 p.m. Tue/Thu, but please email me to make an appointment because I often schedule other meetings during these times.

Teaching Assistant: Brady Detwiler

Email: bld3@rice.edu

REQUIRED TEXTS AND MATERIALS

Class Website: canvas.rice.edu

Required Text: All readings will be made available on Canvas.

Required Material: Bring your laptop to class every day, but please leave your laptop packed away when we are not working on coding exercises.

TOPICS

The course is divided into 3 units, each approximately 4 weeks:

- Unit 1: Measuring Team Strength
Pythagorean Formula, Bradley-Terry Model, ELO Ratings
- Unit 2: Evaluating Player Talent
Regression to the Mean, Hierarchical Models, Projections, Regularized Adjusted Plus-Minus
- Unit 3: Valuing Event Outcomes
Win Probability, Markov Chains, Markov Reward Processes, Markov Decision Processes

COURSE OBJECTIVES AND LEARNING OUTCOMES

After successfully completing this course, you will be able to:

- Use R to apply theoretical statistical models to real-world sports data, and interpret the results.
- Calculate estimates of team and player strengths, adjusting for sample size and strength of schedule.
- Estimate in-game win probability models based on game state (e.g. score, possession, time remaining).
- Identify an interesting research problem in sports, solve it with data, and present your solution.

HOW YOUR GRADE IS DETERMINED

Sport analytics is a demanding and highly competitive field. This class aims to provide the tough but honest feedback that you will need to succeed in it. Note that the points below sum approximately (but not exactly) to 100. Your grade is based on your percentage earned of available points.

| | | | | | | | | |
|------------|---------------|------------------|---------------|---------------|------------|---------------|---------------|----|
| | | [93%, ∞) | \rightarrow | A | [90%, 93%) | \rightarrow | A- | |
| [87%, 90%) | \rightarrow | B+ | [83%, 87%) | \rightarrow | B | [80%, 83%) | \rightarrow | B- |
| [77%, 80%) | \rightarrow | C+ | [73%, 77%) | \rightarrow | C | [70%, 73%) | \rightarrow | C- |
| [67%, 70%) | \rightarrow | D+ | [63%, 67%) | \rightarrow | D | [60%, 63%) | \rightarrow | D- |
| | | [0%, 60%) | \rightarrow | F | | | | |

Practices. (10pts) There are 2 practice assignments, each worth 5pts, each graded for completion. The expected completion time for each practice is 4 hours.

Assignments. (30pts) There are 3 individual assignments, each worth 10pts. You are encouraged to help each other, but your submission must reflect work you have done yourself. Assignments will be graded anonymously, so please remove any personally identifying information from your submission. The expected completion time for each assignment is 8 hours.

Project. (40pts) This is a project-based course, and the project you build in stages over the course of the semester will determine a large chunk of your grade. You are encouraged to work with a partner on the project (no more than 2 students per team), but you may work individually if you wish.

- | | |
|-----------------------------------|--------------------|
| • Project #0 (0pts): Registration | expected hours: 1 |
| • Project #1 (5pts): Proposal | expected hours: 4 |
| • Project #2 (10pts): Abstract | expected hours: 8 |
| • Project #3 (5pts): Presentation | expected hours: 4 |
| • Project #4 (20pts): Paper | expected hours: 16 |

Exit Tickets. (0.5pts per class) We will end most classes with an anonymous survey graded for completion. Showing up and engaging in discussions are important parts of your learning experience in this course.

Article Report. (10pts, SMGT 530 only) There is one additional assignment for graduate students enrolled in SMGT 530. You will read and write a report on a published academic journal article of your choice.

POLICIES

Attendance Policy. If you notify me via email at least one hour before class that you will be absent, then I will excuse you from completing the exit ticket. Please do not expect a response to your email. It is your responsibility to check the schedule and educate yourself on the material you missed.

Generative AI Policy. Generative AI may hinder your learning when used irresponsibly. To that end:

1. You may use generative AI to help you solve coding problems, but it is a violation of the honor code to submit AI-generated code that you do not understand or cannot explain.
2. It is a violation of the honor code to submit AI-generated writing as your own work.

Late Policy. Late submissions are subject to 10% deduction per day.

TENTATIVE SCHEDULE

| Assignment Due | Date | Lesson Plan |
|---------------------------------|--------|---|
| | Jan 12 | Game: Last Name Dice Game |
| | Jan 14 | Workshop: How to Wrangle Data in R |
| | Jan 21 | Workshop: How to Generate Figures and Tables in R |
| | Jan 23 | Lecture: Pythagorean Formula |
| Practice #1: Figures and Tables | Jan 28 | Lecture: Bradley-Terry Model |
| | Jan 30 | Review Day |
| Assignment #1: The Big Game | Feb 3 | Lecture: ELO Ratings |
| | Feb 5 | Guest: TBA |
| | Feb 10 | Workshop: How to Write a Report |
| | Feb 12 | NO CLASS (SPRING RECESS) |
| Practice #2: Report | Feb 17 | Game: Free Throw Shooting Contest |
| | Feb 19 | Lecture: Regression to the Mean |
| | Feb 24 | Lecture: Hierarchical Models |
| | Feb 26 | Lecture: Projections |
| Project #0: Registration | Mar 3 | Review Day |
| | Mar 5 | NO CLASS (POWERS TRAVEL) |
| Assignment #2: The Big Dance | Mar 10 | Guest: TBA |
| | Mar 12 | Workshop: How to Get Sports Data |
| | Mar 17 | NO CLASS (SPRING BREAK) |
| | Mar 19 | NO CLASS (SPRING BREAK) |
| Project #1: Proposal | Mar 24 | Game: First Orchard |
| | Mar 26 | Lecture: Win Probability Models |
| | Mar 31 | Lecture: Markov Chains |
| | Apr 2 | Lecture: Markov Reward Processes |
| Project #2: Abstract | Apr 7 | Review Day |
| | Apr 9 | Lecture: Markov Decision Processes |
| Assignment #3: The Big Dig | Apr 14 | Guest: TBA |
| | Apr 16 | Workshop: How to Prepare a Presentation |
| Project #3: Presentation | Apr 21 | Student Presentations |
| | Apr 23 | Student Presentations |
| Project #4: Paper | May 5 | |

This syllabus is only a guide for the course and may change with appropriate notice.

RICE HONOR CODE

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at <http://honor.rice.edu/honor-system-handbook/>. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

DISABILITY RESOURCE CENTER

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with the Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

MENTAL HEALTH POLICY

The wellbeing and mental health of students is important; if you are having trouble completing your coursework, please reach out to the Wellbeing and Counseling Center. Rice University provides cost-free mental health services through the Wellbeing and Counseling Center to help you manage personal challenges that threaten your personal or academic well-being. If you believe you are experiencing unusual amounts of stress, sadness, or anxiety, the Student Wellbeing Office or the Rice Counseling Center may be able to assist you. The Wellbeing and Counseling Center is located in the Gibbs Wellness Center and can be reached at 713-348-3311 (available 24/7).

TITLE IX RESPONSIBLE EMPLOYEE NOTIFICATION

At Rice University, unlawful discrimination in any form, including sexual misconduct, is prohibited under Rice Policy on Harassment and Sexual Harassment (Policy 830) and the Student Code of Conduct.

Please be aware that all employees of Rice University are “mandatory reporters”, which means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I must share that information with the Title IX Coordinator.

Although I have to make that notification, you will control how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

To report sexual harassment, please contact the Title IX Coordinator at titleix@rice.edu. To explore supportive measures and other resources that are available to you, please visit the Office of Interpersonal Misconduct Prevention and Support at safe.rice.edu.