

Discovery Seminar – Nerds Win Championships: Statistics in Sports

Instructor

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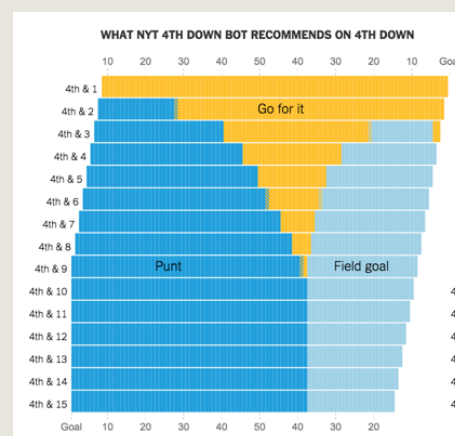
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Office hours: By [appointment](#) M-F, 9a-5p

Time/Location

M/W, 11:30am-12:45pm, Seney 310

[Zoom Address in case we can't meet in person](#)



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Course Description

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Do you have dreams of athletic glory, but not the body or skills to match? Good news! You don't have to thread dimes to a streaking wideout, hurl an unhittable cutter, nail a dagger 3, or bend it like Beckham to win championships...if you know a little math. Traditionally jocks and nerds are like oil and water, but they're increasingly more like chocolate and peanut butter. The athletes on the field make the plays, but behind the scenes coaches and - increasingly - statistical analysts are setting them up for success. Stats nerds figure out better ways to value and compare players, make smarter in-game decisions, and keep athletes healthy. In this course you'll question and learn from experts in various sports how statistics and geometry can be used to break down a soccer pitch, how to quantify the unquantifiable contributions of an offensive line, and whether LeBron is really better than MJ. You will develop the skills to generate and ask meaningful questions, answer those questions using a mix of quantitative and qualitative evidence, and communicate those answers to diverse audiences. You'll also create your own sports analytics project you can showcase to the public and teams.

Learning Objectives

Discovery Seminars Overall

1. Engage students in inquiry-based learning to begin to ask more meaningful questions, question and examine evidence more rigorously, and use evidence in argument more effectively.
2. Expand students' communication skills.
3. Develop students' information literacy through engagement with the library and other appropriate resources.

Our Course

1. **Improve** our overall problem solving and critical thinking
2. **Learn** how we learn from data by asking meaningful questions and rigorously examining relevant evidence in sports
3. **Gain** an understanding of basic statistical/analytical concepts and their applications in sports, including: data acquisition, storage, and access; data analysis; and data visualization
4. **Conduct** sports statistical analyses using R
5. **Practice** effectively communicating analytical findings, arguments, and conclusions to diverse audiences

Course Materials

Primary Course Resources

The primary materials that contain the information you will be responsible for will be varied. There is no textbook for this course (although I have provided a list of textbooks and other resources on Canvas for those who want to dig deeper than we will go in this first-year seminar!). Instead, blog posts, papers, and book chapters, and

even the occasional Twitter thread will be provided to you on Canvas. All will be provided to you freely.

Presentations and Labs

Each unit will contain 1-2 Powerpoint presentations and RMarkdown lab documents. These are all free and will be posted on the course website.

Computing Needs

A laptop or desktop is required for this course. You need either a Windows, Mac, or Linux machine. Chromebooks (specifically the chrome OS) cannot run the statistical programming language R we will be using.

The library has such laptops available for checkout, or there are other solutions! Please come talk to me if you don't have an appropriate laptop or desktop.

Course Structure and Online Sessions

Weekly Expectations and Schedule

The course meets Tuesdays and Thursdays. The core of the course is 8 weeks comprising 4 2-week modules on different statistical topics in sports (SEE [Schedule](#) below). Each of these 2-week modules will be structured as follows:

- First Tuesday: Overview of topic
 - Pre-Class Assignment: Readings
- First Thursday: Practical R lab
 - Pre-Class Assignment: None
- Second Tuesday: Article Discussions
 - Pre-Class Assignment: Readings (selected articles)
- Second Thursday: Guest speaker
 - Pre-Class Assignment: Guest speaker questions

Other classes are more varied and are as listed or described in the course schedule.

Attendance

Attendance is required and will be taken daily. To accommodate occasional needs you get 5 free misses with no penalty – after that, 1% off your final grade for every absence. But hopefully we'll all be having so much fun with sports this won't be an issue!

As part of these 5 misses, **DO NOT COME TO CLASS** if you are substantially ill: significant coughing or sneezing (unless you're confident it's allergies), loss of taste or smell, fever over 100F, body aches, or difficulty breathing. I will make accommodations to answer any questions you have about the material, as well as for additional days beyond your allocated 5 if the need is demonstrated.

And if you anticipate wanting a letter of recommendation, please come to >90% of classes or let me know proactively why you're missing a large number of class sessions.

Assignments and Grading

Pre-Class Reflections (20%; 12 opportunities at 2% each, up to 2 missed assignments)

This is basically your participation grade. In many class sessions (in the 16 sessions across the 5 main units, all sessions *except* the R Practical Lab) you are expected to submit a Reflection response in that day's thread on the Canvas Discussion board. These should be ~2-4 sentences or 50-100 words and show you engaged intellectually with the readings in some way *or* have prepared for our guest speaker. These do not need to be profound insights. If you did the readings they should take you 5-10 minutes to write.

These are due on the Canvas Discussion board by 6:00am the day of class so I can review them beforehand.

Each Reflection is graded on a check (2 pts), check-minus (1 pt), or missing (0 pts) scale. If you receive a check-minus, you may attempt one revision within 48 hours. Your two lowest grades will

be dropped.

Article Report + Analysis (10%)

Once during the semester you will be asked to identify a reading/analysis for class discussion. Alongside this you will also be asked to write a more detailed (1-2 page) report on the article. More details will be provided on the assignment itself.

Lab Homeworks (30%, 3-5 at percent commensurate with their work)

After some practical R labs there will be a homework assignment to practice your skills. They are due at 6:00pm on the days indicated in the course schedule below.

Project – 40%

The bulk of your grade will come from a sports analytics project you'll complete during the semester. More details are forthcoming, but it will involve a proposal; a presentation; and a written report.

Below is the grading scale for this class. Grades are not rounded. I maintain the right to curve the class at my discretion, but it will only be done to *boost* grades (i.e. make each cutoff easier to reach), never the reverse.

A		B			C			D			F
	–	+		–	+		–	+		–	59%- 0%
100%- 93%	92%- 90%	89%- 87%	86%- 83%	82%- 80%	79%- 77%	76%- 73%	72%- 70%	69%- 67%	66%- 63%	62%- 60%	

Extra Credit (2%)

We are going to do a class fantasy football (NFL) league! The draft will be held during a class day prior to the start of the regular season.

I recognize some of you do not know American football or the NFL very well. That's OK! Per the pre-semester survey many of you are big fans, so anyone who wants to will be paired up with someone who loves football. And the season happens to line up almost perfectly with our class. What can I say?

The extra credit will be given as follows:

1% is for setting a lineup without any injured players or players on a bye each week (that is, a bonus for paying attention to the league). For each week you fail to do this, 0.1% will be deducted from your total extra credit.

The other 1% is for submitting a paragraph outlining how analytics played into your strategy during your drafting of your team *or* how it led you to change your team during the season. You may also instead write retrospectively (after we learn more about analytics during the semester) about how what you know now would have influenced your strategy. This may be turned in at any time during the semester up to the beginning of finals – whenever you feel comfortable, which will likely depend on how much you know about football analytics to begin with. If you are part of a pair, each person should submit their own paragraph for this portion of the extra credit.

If I am not in the top 4 teams in the last week of the semester I will throw you all a Chick-Fil-A breakfast party. Aren't you glad you read the syllabus now?

Questions and Communication

Communication is very important in online classes to foster community and maintain good relations between students and instructors.

Asking for Help

There are 3 options for asking questions in this class, listed in order of preference:

1. **Canvas Discussion board:** If you have a question about a course topic or course logistics, simply create a post here. If it's a question or thought about course material, you may add it to a thread for that day if it already exists.

This is our preferred communication option. It is where all questions about course material and assignments should go. In short, anything that could conceivably be useful to another student should go here. This reduces duplicated efforts, encourages interacting with your fellow students, and puts everyone on a level playing field. It's win-win-win!

I understand some students may be shy, but please know: there are *no* stupid questions, and I have a zero tolerance policy for any bullying or

mockery.

2. **Office Hours:** You can always ask questions about or for extra help with the course material in office hours, though I might ask you to consider making a Discussions board post with what we talked about if it'll be helpful for others.

Office hours are also a great option if you have questions about material that extends beyond this course, want to talk about careers, mentoring, academic advice (e.g. you're curious about Quantitative Theory and Methods), or simply want to introduce yourself so I know you better later for things like letters of recommendation or research opportunities.

I didn't often take advantage of office hours when I was an undergraduate because I didn't really understand what they were for and slightly regretted it later on.

[Check out this great video on what office hours are for and common misconceptions!](#)
(Though also note this semester I am offering a

flexible appointment-only office hours system.)

3. **Email:** The third option. If it's a question that will be useful to other students, I will ask you to put it on Canvas Discussions instead. Issues appropriate for email include questions specific to your or your group's assignment or project, or other personal matters that need to not be

broadcast to the rest of the class (e.g. accommodation requests, absence explanations).

For emails and Discussions board posts, please allow 24 hours for a response from me, or 48 hours on weekends (your fellow students may be quicker, but don't take what they say as 100% correct until I sign off on the response). Please plan accordingly.

A Statement on Empathy

(Text modified from Prof. Andrew Heiss at Georgia State.)

Life is chaotic right now.

In addition to the normal stresses of life and of being your age, the pandemic has upended all of our lives in various ways, from lost jobs and economic uncertainty to health problems. If it helps, I graduated straight into the Great Recession in 2008 and came through it OK (though many people had a much rougher time). Seriously, I got hired at a consulting firm 2 months before Lehman Brothers collapsed. So you're not doomed.

I'm fully committed to making sure that you learn everything you were hoping to learn from this class! I will make whatever accommodations I can to help you finish your exercises, do well on your projects, and learn and understand the class material.

If you tell me you're having trouble, I will not judge you or think less of you. You never owe me personal information about your health (mental or physical). However, **in order to most effectively help you I DO need to know when something is going on proactively (meaning ASAP)**. If you need a special extension on assignments for extenuating circumstances, that's much easier for me to do at the time than 6 weeks later at the end of the semester, when it may be impossible for you to catch up anyway. Does that make sense?

You are also always welcome to talk to me about things that you're going through. If I can't help you, I usually know somebody who can – such as [Counseling and Career Services](#). I have experience with close family serious sickness and death when I was your age; as well as less age-specific experience with family mental health and substance abuse issues and my own struggles with depression. I am also a survivor of an immediate family member's suicide.

If you need extra help, or if you need more time with something, or if you feel like you're behind or not understanding everything, do not suffer in silence! Talk to me. I will work with you. I promise.

I want you to learn lots of things from this class, but I primarily want you to stay healthy, balanced, and grounded.

Diversity

Diversity and Inclusivity

Oxford College of Emory University's ideals of inclusivity require that we foster an environment where people of diverse backgrounds, identities, abilities, and ideologies are affirmed, respected, and seen as a source of strength; where we strive to learn together, and ultimately thrive communally. If we at all fail to support these ideals, then we encourage discussion towards improvement, and we hope that this statement affirms your right to seek those discussions via dialogue with faculty, staff, and your peers.

I try my best to create a welcoming and inclusive environment for all students regardless of race, gender and gender identity, religion, immigration status, nationality, parental status, or age. If I ever fall short of that, I encourage you to approach me personally after class, during office hours, or via email and help me understand how I can do a better job of that. There are also college-level resources to express concerns if you would prefer not to approach me personally.

Kids in the Classroom

If you're a parent and you ever have a childcare issue and need to bring your child to class, I completely understand and welcome their presence. Fair warning, though: I retain the right to make funny faces at them.

COVID-19 and Other Long-Term Health Issues

If you are placed under quarantine for COVID-19 or are going through any longer-term health or personal issues that may affect your success in the class, please let me know. In addition – or alternatively, if you're more comfortable – I invite you to coordinate with the Advising Support Center (ASC) oxacadsvic@emory.edu. They are very helpful.

Access and Disability Resources

As the instructor of this course I endeavor to provide an inclusive learning environment. I want every student to succeed. The Office of Accessibility Services (OAS) works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, please contact the OAS and complete the registration process. Faculty may not legally provide you with accommodations until an accommodation letter has been processed and discussed with them; accommodations do not start until this point and are not retroactive, so **I ask you to let me know about accommodations ASAP so I can best help you.**

Students registered with OAS who receive a letter outlining specific academic accommodations are invited to immediately coordinate a meeting with their professors to discuss a protocol to implement accommodations that will (or may) be needed over the course of the semester. This meeting should occur **as early in the term as possible**. Contact OAS for more information at (770) 784-4690 or oas_oxford@emory.edu.

Class Session Recording

From time to time, particularly but not limited to if we are on Zoom, class sessions may be recorded for students in the class to refer back to the information, and for enrolled students who are unable to attend live. By attending class either in-person or on Zoom you are consenting to video or audio recordings.

Please read the [Rules of Zoom Engagement](#) for further advice on participating in any Zoom class sessions.

Academic Integrity

There are two key principles for this course (and for Oxford generally):


- Your work should represent your *own* effort and thought. That means...
 - Do not plagiarize (copy someone else's work or your own work without attribution).
 - Do not turn in things that include no original thoughts of yours or that are entirely someone else's work, even if that work is cited.
 - If this were a pottery class with an assignment to create a coffee mug, it would certainly be OK for you to get the clay, sculpt the mug, put it in a kiln, paint it, and turn it in.
 - It's *also* OK to say "Hey, I found this plain unpainted mug from Bridgette in the kitchen cabinet," paint it yourself, and turn that in while making it clear Bridgette made the original mug. You made a contribution to that mug, building off someone else's work.
 - It is NOT OK to go to the store, buy a pre-made and painted mug, and turn that in as your work (or even while making it clear you just went out and bought it at a store). In this metaphor this is like copying an assignment from a friend.
 - It is also NOT OK to just give me a mug you made for a prior class. You need to at least re-paint it.
- In the case of the group project, anything for which you receive a grade should contain *meaningful intellectual input* from you. That is, you should not receive credit for a group project if your group members did all the hard work.

General Statement: Upon every individual who is a part of Emory University falls the responsibility for maintaining in the life of Emory a standard of unimpeachable honor in all academic work. The [Honor Code of Emory College](#) is based on the fundamental assumption that every loyal person of the University not only will conduct his or her own life according to the dictates of the highest honor, but will also refuse to tolerate in others action which would sully the good name of the institution. Academic misconduct is an offense generally defined as any action or inaction which is offensive to the integrity and honesty of the members of the academic community. The typical sanction for a violation of the Emory Honor Code is an F in the course. Any suspected case of academic misconduct will be referred to the Emory Honor Council.

Course Schedule (Fall 2023)

<u>Date</u>	<u>Topics</u>	<u>Readings & Pre-Class Prep</u>	<u>Assignments Due</u>	<u>Key Takeaways</u>
24-Aug	Introductions!	Think about your favorite sports highlight		We're here to have fun and learn, in that order Classroom = community
29-Aug	Course Introduction; Overview + History of Stats in Sports	These blog posts (all <5 minutes): Why Sports Analytics Links to an external site. Team Uses Part I Links to an external site. Team Uses Part II Links to an external site. League Uses Links to an external site. Media Uses Links to an external site. Sports Business Analytics Links to an external site. (skim)		Course syllabus Broad applications of sports analytics History of sports analytics
31-Aug	Class Fantasy Football Draft!	Any pre-draft research you want		Beat me = Chick-Fil-A
5-Sep	Introduction to R	Install R and RStudio (complete Tutorial 0) Download Install R and RStudio (complete Tutorial 0)		R scripts and RMarkdown
7-Sep	Introduction to R (continued)	--		Rectangular data

				Exploring data in R Data manipulation in R Basic data visualization in R
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12-Sep	Basketball: Overview	<p>(I know this looks like a lot, but most of these are quite short and accessible!)</p> <p>1) IF NOT FAMILIAR WITH BASKETBALL:Watch this 5-minute videoLinks to an external site.</p> <p style="text-align: center;"></p> <p>2) Introduction to Oliver's Four Factors (read through "Measuring Impact on Success" section)Links to an external site.</p> <p>3) An Introduction to Advanced Basketball Statistics: Individual StatisticsLinks to an external site.</p> <p>4) An Introduction to Advanced Basketball Statistics: Team StatisticsLinks to an external site.</p> <p>5) <i>Basketball on Paper</i> by Dean Oliver, Ch. 24 (pp. 337-42). Available via Emory library. Search for book title, find online access, navigate to it, select chapter 24.</p> <p>6) 5.5-minute video of Bomer Jones and Pablo Torre discussing Jalen Rose, race, and NBA analyticsLinks to an external site.</p> <p>7) How Mapping Shots in the NBA Changed it ForeverLinks to an external site. (Goldsberry, FiveThirtyEight)</p> <p>8) This New NBA Stat Is A Huge Step Forward For Basketball Analysis (Tracking Data, EPVA)Links to an external site. (link does not appear to show graphic referenced in article, so please download that here and have it open alongside article)</p>	Reflection	
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OPTIONAL:

[Nylon Calculus 101: Plus-Minus and Adjusted Plus-Minus](#)[Links to an external site.](#)

[What is the Best Advanced Statistic for Basketball? NBA Executives Weigh In](#)[Links to an external site.](#)

14-Sep	Basketball: R Lab		Lab HW 1 DUE	
15-Sep			Basketball Article Discussion Choices	
19-Sep	Basketball: Article Discussions	<ol style="list-style-type: none"> 1. Kyrie Irving's Stats Aren't Worth the DramaLinks to an external site. 2. Lebron James and the Slam Dunk Aging CurveLinks to an external site. 3. Why Has the NBA Seen so Many 50-Point Games this Season?Links to an external site. 4. NBA Teams are Driving More Than Ever BeforeLinks to an external site. 	Reflection	
21-Sep	Basketball: Guest Lecture (CANCELED - CATCH UP DAY)		Reflection	
26-Sep	Football: Overview	<ol style="list-style-type: none"> 1) IF NOT FAMILIAR WITH FOOTBALL: Watch this 6-minute videoLinks to an external site. 2) How One Advanced NFL Statistic is Going Mainstream (EPA)Links to an external site. AND check out ways of visualizing more recent team and player EPA on this page (especially Team Tiers tab)Links to an external site. 3) 2022 NFL Analytics SurveyLinks to an external site. 4) A New Analytics Tool for Fourth Down [and] 2-Point ConversionsLinks to an external site. 	Reflection	

		<p>5) R for NFL AnalysisLinks to an external site. (just review the plots Mike Lopez created)</p> <p>6) The 10 commandments of numbers-based football analysisDownload The 10 commandments of numbers-based football analysis</p> <p>OPTIONAL:</p> <p>7) Peruse the websites of Next Gen StatsLinks to an external site., Sumer SportsLinks to an external site., Pro Football Focus (PFF)Links to an external site., and/or Pro-Football-Reference (PFR)Links to an external site.</p> <p>8) Pass Rush and Pass Block Win Rate Metrics Explainer (ESPN)Links to an external site.</p> <p>9) Rethinking Draft CurvesLinks to an external site.</p>		
28-Sep	Football: Overview con'td "Why Are You Here"		Lab HW 2 DUE	
29-Sep			Football Article Discussion Choices	
3-Oct	Football: Guest Lecture	Read and listen to materials listed in Module	Reflection	
5-Oct	Football: R Lab			

10-Oct	FALL BREAK!!!			
12-Oct	Football: Article Discussions	1. Impact of Special Teams on NFL Success 2. Pass or Run: A Guide for NFL Play Calling 3. Big Plays are the 3-Pointers of Football 4. A Look Into Offensive Personnel Diversity 5. The Continued Emergence of the Mobile Quarterback	Reflection	
17-Oct	What Makes a Good Statistic? + Project Brainstorming	IF NOT FAMILIAR WITH BASEBALL: Watch this 3.5 minute video Pitching and Defense: How Much Control do Hurlers Have (Voros McCracken) Links to an external site.	Reflection (project question ideas)	
19-Oct	Football: Article Discussions (cont'd) + Catch-Up			
24-Oct	Library I: Choosing a Research Topic + Soccer Overview	Review materials in Library Module prior to class Guest lecture: Paige Crowl AND 1) IF NOT FAMILIAR WITH SOCCER: This 4-minute video 2) xG Explained 3) Soccer is Learning to See the Whole Game	Reflection	Crafting an answerable research question Finding Sports Data

		<p>4) The Athletic's Football Analytics GlossaryLinks to an external site. (PDF if link doesn't work Download PDF if link doesn't work- ignore comments that fill last 20 pages)</p> <p>5) Possession is the Puzzle of Soccer Analytics. These Models Are Trying to Solve It.Links to an external site.</p> <p>OPTIONAL</p> <p>How Our Club Soccer Predictions Work (FiveThirtyEight)Links to an external site.</p>		
26-Oct	Soccer: Overview (cont'd) + Soccer: R Lab			
27-Oct			Soccer Article Discussion Choices	
31-Oct	Soccer: R Lab (cont'd)			
2-Nov	Soccer: Article Discussions	<p>1. StatsBomb Release New Models: Expected Pass (xPass) and Pass ClusteringLinks to an external site.</p> <p>2. How Consistent Was Every Premier League Lineup This Season?Links to an external site.</p> <p>3. Slice It Up: Introducing Opta Player RadarsLinks to an external site.</p> <p>4. Closing Down: How Defensive Pressure Impacts ShotsLinks to an external site.</p>	Reflection	

7-Nov	Soccer: Guest Lecture	<p>Guest Lecturer: Sean Steffen, former analyst with Houston Dynamo and current writer with American Soccer Analysis (and Ox alum!)</p> <p>Listen to podcast episode and read one article in Module before class</p>	Reflection	
9-Nov	Field Day (??)			
14-Nov	Sports Business: Overview + Guest Lecture (Justin Watkins, Atlanta Braves)	Read materials in Module before class (22-page chapter on sports business + 1 paragraph intro to Justin Watkins)	Reflection	
16-Nov	Library II: Assessing Source Reliability + Catch-Up	<p>Watch materials in Module before class (2 short videos)</p> <p>Guest lecture: Paige Crowl</p>		Critically evaluating sources of data, analyses
17-Nov			Sports Business Article Discussion Choices	
21-Nov	Thanksgiving Week - NO CLASS!!!			

23-Nov				
28-Nov	Sports Business: Article Discussions	1. How A Tennis Tournament In Queens Generates \$500 Million In Annual Revenue Links to an external site. 2. How The NBA Became A \$10 Billion Annual Business Links to an external site. 3. Stadium Analytics: Increasing Sports Fan Engagement With Data and AI Links to an external site.	Reflection	TBA
30-Nov	Project Workday			
5-Dec	Final Project Presentations + Conclusion and Wrap-Up			
9-Dec	Final Project Reports Due!			