BM7334: Sports Analytics–Syllabus

Summer 2019 - Term 1

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Class Schedule: 10:15-12:00pm Saturday 5/11, 5/25, 6/8

Recitation/Office Hours: Wed. 6:30-8:00 PM & by appointment

Course description

Analytical techniques and quantitative methods are on the rise in many areas of industry, and, of late, have entered the sports realm. Students will expand their critical thinking skills, explore the current state of sports analytics, summarize data creatively, improve data-based decision making, and optimize output in real-world situations as well as improve presentation skills to the non-quant.

Course learning outcomes

By the end of this course, students should successfully be able to:

1. Discover, analyze, and appraise methods in the current state of sports analytics including basic descriptive statistics, visualization, modelling, deeper machine learning, and Bayesian methods.
    a) Utilize the R computer language to understand, reproduce, and extend current sports analytics research in a reproducible manner.
    b) Demonstrate a familiarity of how to acquire data and explore the current research using a variety of internet based tools.
    c) Improve skills in machine learning and deeper statistical techniques through application in the realm of sports.
2. Develop a simple question of interest, formulate a plan of analysis, and explain the results of research to a layperson/"water-cooler" sports fan.
    a) Identify a question from current or past data to add to the current body of knowledge in sports.
    b) Breakdown the research methodologies performed and produce an analysis consumable by those without deep analytic knowledge.
    c) Present the results via a short visualization/white paper that distills the information to the level of a layperson.
3. Develop a more detailed question of interest, formulate a plan of analysis, and synthesize current research methods to produce insight into that question as well as present the results in a clear and concise manner to people in the sports analytics industry.
    a) Identify a question from current or past data to add to the current body of knowledge in sports.
    b) Employ deeper statistical/data science methodologies to explore the data and provide insight.
    c) Present the results of the analysis on the level of peers in the analytics community.

Course Materials

1. Textbook: *Mathletics*, Winston Free access for OSU students
2. Textbook: *Scorecasting*, Moskowitz and Wertheim Amazon purchase
3. Additional Articles and Materials posted on Carmen

–Supplementary Textbook: *Introductory Statistics with R*, Dalgaard Free Download on Springer Link

Course Components and Grading Breakdown

Assignment Category	**Points**
Podcast Discussion and Participation	15
Weekly Mastery Problem Sets/Datacamp	15
Weekly Quizzes (1 attempt)	10
In-class Activities	15
HOF Presentation	15
Final Project	30
Total	100

Late submissions will not be accepted. Please refer to Carmen for due dates.

Datacamp Assignments

"This class is supported by DataCamp, the most intuitive learning platform for data science. Learn R, Python and SQL the way you learn best through a combination of short expert videos and hands-on-the-keyboard exercises. Take over 100+ courses by expert instructors on topics such as importing data, data visualization or machine learning and learn faster through immediate and personalised feedback on every exercise."

Throughout this course, there will be a few assigned courses within datacamp to complete. The due dates can be found on the course schedule, but they can be completed at your leisure. You will receive another email to enroll in the datacamp courses.

Weekly Mastery Problem Sets

The best way to learn, it to "do". Each week, a problem set will be delivered via a Carmen quiz. These "quizzes" will be untimed, open material, and collaboration (not copying) is **encouraged**. These problem sets can include multiple choice, true/false, or numeric answers. The homeworks must be submitted by 11:59 PM on Sundays. Late assignments will not be accepted. Students have infinite attempts on the 'quiz'. The purpose is simply to keep on track and self diagnose problems along the way thus generating more insightful questions.

Weekly Quizzes

Each week will have one 'quiz' consisting about 3 questions for which you will have 1 attempt. These questions will be similar to the problem sets, but will provide for an opportunity for open ended questions/graph submissions. You are still welcome to collaborate on this section with classmates. As with the problem sets, submissions are due Sunday at 11:59 PM. No late quizzes will be accepted.

Podcast Discussion/Participation

Students will listen to the "Wharton Moneyball" podcast. The podcast is a weekly sports analytics podcast put out by the Wharton School of Business at UPenn. A discussion board post seeded with questions by me will appear on Monday relating to the previous week's podcast. Students will be graded on participation in the discussion board. For each podcast, students should at minimum comment on the previous podcast and address at least one of the questions provided. They should also comment on other students posts. Discussion

on the podcast will also take place in the in-class meetings. The focus is on the content of the post and general contribution to discussions.

A separate discussion board will be available for general class discussion on interesting articles discovered over the course of the semester. This discussion won't be explicitly graded, but additional participation is encourage.

Hall-of-Fame Presentation

For this assignment, students will argue for or against a potential future Hall of Famer. Each individual will have a short presentation of around 5-7 minutes to argue for their side. The presentation should include a slide deck (uploaded to Carmen) of 4-5 slides to make your case as well as a link to the presentation (video form). Collaborative tools and presenatation capture will be discussed in class.

The presentation should include:

- A clear side taken on the player's merits or lack thereof.
- Specific statistics and analytical evidence supporting your argument (career stats, achievements benchmarks). Comparisons with current hall of famers or non-hall of famers if a good idea! Use of online data repositories (sports reference sites) is HIGHLY encouraged.
- A visualization (or two or three) of some sort illustrating your evidence. This can take the form of a scatterplot, histogram, radar plot, boxplot, etc. Anything that supports your player getting in the hall of fame (or staying out).

Only borderline hall-of-famers (by the professor's discretion) will be accepted for the project. A potential list will be provided. Each prospect/side can only be chosen by a single student (i.e., one person can argue for Eli Manning and another can argue against Eli Manning, but no doubling up). The level of analytics presented should be such that a casual follower of the sport can follow the argument. Some advanced statistics can be used but should be clearly defined for the lay person.

In-class Activities

The weeks in which we meet, we will also have a mini-project to complete worth 5% of the grade. These will involve some more focused intense data analysis in groups and some hands on data-collection as well. Part of the in-class session will be devoted to questions/clarification but most of the time will be spent in a more holistic activity covering the 2 weeks of online content consumed.

Final Project

The project will consist of a group or individual effort to analyze a sports question of interest. You have the leeway to choose whatever question in any sport (pending my approval). The requirements are that the question is clearly explained and answerable via data analysis and using methods discussed in the course (i.e., linear regression, logistic regression, hypothesis testing, optimization, etc.). The current plan is a short paper defining the problem, an analysis of the methods used, and a conclusion.

Other Course Policies

Recitation/Office Hours

Each week, I will be available remotely via WebEx or Zoom (link to be provided) for synchronous office hours from 6:30-8:00 PM on Wednesday evenings. These sessions will provide students with the ability to ask probing questions on the current material and clarify gaps in understanding. Feel free to bring problems from the book or outside questions for practice as well. If you have a specific question that you'd like to delve into, please bring it up on the discussion board so I can adequately prepare a solution in advance if possible. If you plan on attending for some or all of the hours, please make sure to sign in no later than 7:00 PM (or

contact me in advance). If no one enters the session by 7 PM (or the room has emptied), I will assume there are no questions and shut down the session. You are always welcome and encouraged to send me emails with questions outside of this time. We can also meet up one-on-one via skype (SkypeID: JohnDDraper) if you need assistance outside of the scheduled hours.

Course technology and help

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at https://ocio.osu.edu/help/hours, and support for urgent issues is available 24x7.

- Self-Service and Chat support: http://ocio.osu.edu/selfservice
- Phone: 614-688-HELP (4357)
- Email: 8help@osu.edu
- TDD: 614-688-8743

Microsoft Office 365

All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Full instructions for downloading and installation can be found https://ocio.osu.edu/kb04733.

Faculty feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call 614-688-HELP at any time if you have a technical problem.)

- Grading and feedback: For large weekly assignments, you can generally expect feedback within 7 days.
- E-mail: I will reply to e-mails within 24 hours on school days.
- Discussion board: I will check and reply to messages in the discussion boards every 24 hours on school days.

Academic integrity policy

Policies for this Online Course

- Quizzes and exams: You must complete the midterm and final exams yourself, without any external help or communication.
- Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- Falsifying research or results: All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- Collaboration and informal peer-review: The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and

honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute "Academic Misconduct."

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct, so I recommend that you review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages
- Ten Suggestions for Preserving Academic Integrity
- Eight Cardinal Rules of Academic Integrity

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Accessibility Accomodations for Students with Disabilities

Requesting accommodations

If you would like to request academic accommodations based on the impact of a disability qualified under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, contact your instructor privately as soon as possible to discuss your specific needs. Discussions are confidential. In addition to contacting the instructor, please contact the Student Life Disability Services at 614-292-3307 or ods@osu.edu to register for services and/or to coordinate any accommodations you might need in your courses at The Ohio State University.

Go to http://ods.osu.edu for more information.

Accessibility of course technology

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- Carmen (Canvas) accessibility
- Streaming audio and video
- Synchronous course tools