CDS 290: Game (and Sports) Analytics

Fall 2021
Syllabus and Class Policies

Instructor: Ralph P. Romanelli, PhD

Office and Office Hours:

- Dr. Romanelli's office is in Planetary Hall Room 117 on the Fairfax Campus.
- Office Hours are on Friday from 10:00 PM to 12:00 PM.
- Dr. Romanelli may be contacted by e-mail and by using the "Ask the Professor" discussion on the left side of the website as well as in-person. Dr. Romanelli's responses on "Ask the Professor" will be available to all class members.
- Meetings outside of Office hours are by appointment only. Students wishing to meet with Dr. Romanelli are asked to send an e-mail to Dr. Romanelli requesting a meeting time. Be sure to list when you are available to meet and how you want to meet.
- Dr. Romanelli will endeavor to answer e-mail questions within 24 hours. Please note that Dr. Romanelli teaches other courses, so questions received during the weekends/ holidays, may be delayed.
- If Dr. Romanelli will be away from email for an extended time-period, times will be posted on the Announcements in the Blackboard course folder.

Safe Return to Campus

CDS-290 is an in-person class. There preparations needed for safe return to campus; students are encouraged to read and follow the MASON Safe Return to Campus Plan.

https://www2.gmu.edu/safe-return-campus#

CDS-290 General Help Sessions:

- Dr. Romanelli will announce any General Help Sessions being held either in-person or on the class website or both. On-line sessions will be held via Blackboard Collaborate Ultra.
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Emails

- Dr. Romanelli rromanel@GMU.EDU 703-829-5516 (Google Number)

Course Introduction and Overview

CDS-290 Overview:

CDS-290 is an introductory course in how to think computationally about Game and Sports Analytics. Thinking computationally is a problem-solving methodology where computational and statistical tools (e.g., Excel and R) are used to solve game and sports problems. Thinking computationally approaches problem solving by first developing a statistical model to

represent what is happening in a game or sporting event and then converting that model into a statistical solution to solve the problem being investigated.

- Examples of game and sporting problems that will be solved in CDS-290 include analyzing the effect of the Designated Hitter in Major League Baseball, the Probability of Streaks in Sports, and how to use random numbers to simulate and analyze player performance. We will examine how to compare performances of athletes from different sports and different eras as well as look at questions like who had the faster runners in the Boson Marathon of 2019, the Kenyans or the Ethiopians?
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In this course, you will learn how computer and statistical algorithms are developed to model events, how they are used to solve problems and how to use the tools Excel and R, in the problem solving. Developing statistical and computer algorithms is a process methodology which will be directly applicable in many scientific and business careers.

Follow-on GMU courses provide the opportunity for students to build on the basic methodologies learned in CDS-290 with learning other computer and statistical tools, more advanced techniques for more complex problems, and solving problems involving large amounts of data. Following this course, you may consider going on to complete a minor or a major in this field.

Results of salary surveys in 2018-2020 clearly showed that young professionals in the Washington, DC, area with backgrounds in computational data sciences are in high demand. In fact, surveys show that skills in computational data science are among the fastest growing talent needed. The survey found many job openings requiring CDS skills of qualified candidates. The result was that salaries for early career professionals with CDS skills were about $10,000 higher than their peers.

I understand that many CDS-290 students have not had a course in statistics. CDS 290 will teach you the basic statistics you need to analyze sports data. We will teach you how to use Excel and R to perform statistical calculations and plots. As a result, CDS-290 focuses on the basics of statistics and turning data into information. Additionally, CDS 290 meets some of the Mason Core Requirements for Information Technology.

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CDS-290 Learning Outcomes:

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

(Meeting the "IT" portion of the Mason Core Requirement)

- Use technology to locate, access, evaluate, and use information. Identify IT concepts in a range of current and emerging technologies and apply appropriate techniques to a range of tasks using Excel and R.
- Explain how Excel and R represent data graphically.
- Apply statistical techniques to solve problems in social (game and sports) application areas
- Apply methods for dealing with data across multiple disciplines
- Apply critical thinking skills to the development of computer and statistical simulations and models
- Develop scientific programs in Excel and R to solve statistical modeling problems.
- Apply good problem-solving techniques for the simulations and models.

Dr. Romanelli's Preliminary Advice to Succeed in CDS-290:

- It is strongly recommended that you stay on top of the workload for this course! There is a consistent amount of work, week after week, to be done in CDS-290.

1. Experience shows that CDS-290 assignments become highly demanding for students who choose not to invest time in their readings and other assignments - or both.
2. It is realized that CDS-290 students' Excel and R skills maybe minimal, so the course is paced to help everyone. Lectures involving Excel and R skills are integrated into the topics as needed.
3. R is a statistical analysis tool. Use of R will be taught. It's use is also integrated into the textbook lessons and lectures.
4. The ability to locate data sets and download them (into Excel and R) is essential to analyze data and create solutions for the course problems. This skill will be utilized throughout the course.

- **HINT**: Students who begin homework early in the week have the time to ask the instructors for help on questions or clarification on skills and concepts.

1. Remember that the only dumb question is the one you do not ask.
2. I can guarantee that someone else has the exact same question.
3. So, asking not only helps yourself, but will help your classmates.

Textbooks: Analytic Methods in Sports: Using Mathematics and Statistics to Understand Data from Baseball, Football, Basketball, and Other Sports, 2nd Edition

Published by CRC Press/Taylor & Francis Group
Recently Released (April 15, 2020)

--Covers statistical and mathematical methods chosen specifically because of their importance and usefulness in analyzing sports data.
--Designed for readers who love sports and sports statistics and who would like to be able to conduct their own statistical analyses of sports data.
--Examples in the book cover a wide range of sports including baseball, football, basketball, soccer, hockey, golf, tennis, and lacrosse.
--Instructions on using Excel to perform the analyses are provided.
--Designed for readers who are comfortable with mathematics but who do not necessarily have any previous experience with formal statistical methods.
--Advanced methods presented include *binary response models, random effects, multilevel models, spline methods, and principal components analysis, and more.*
--The datasets that are used in the book are available on Dr. Severini's website. And also on our Blackboard site in the Course Content Folder.

Statistics: The Art and Science of Learning from Data (4th Edition) Alan Agresti, Christine A. Franklin and Bernhard Klingenberg

Statistics: The Art and Science of Learning from Data, Fourth Edition, (the Fifth edition is available) takes a conceptual approach, helping students understand what statistics is about and learning the right questions to ask when analyzing data, rather than just memorizing procedures. This book takes the ideas that have turned statistics into a central science in modern life and makes them accessible, without compromising the necessary rigor. Students will enjoy reading this book and will stay engaged with its wide variety of real-world data in the examples and exercises.

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- Class materials are made available through the class website on Blackboard.
- Class Lectures and Presentations are made available in the native PowerPoint (.pptx) format.
- Datasets are available for download as well.
- Online office hours and help sessions will be presented via Blackboard Collaborate Ultra.

Course Logistics

This course will meet in the Art and Design Building Room 2026 on Mondays and Wednesdays from 1:30 PM to 2:45 PM and we will use other means of keeping in touch such as email and Blackboard Announcements.

- All activities and assignments are submitted through Blackboard by the due date listed.
- You should expect to spend approximately 9-10 hours on coursework each week (this includes the time you spend in the classroom).
- Since the material is cumulative, it is critical that you keep up with weekly requirements.
- Activities and assignments will ONLY be accepted until the due date. Late items will **NOT** be accepted.
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Computer Requirements

Students are required to provide their own computer and internet access or be able to use a GMU provided computer with access to the Internet. The computer must have:

Hardware minimums:

- Reliable Internet connection
- Sufficient capabilities to run Excel and R software. Click on the following link to see Excel as part of MS Office 365: http://tsd.gmu.edu/services/office365/first-time.cfm)
- A Thumb Drive or other computer storage. Only a few mega-bytes will be needed.
  (This will give you a means to save your Excel code so it can be reused as well as class handouts and assistance information sheets.)
- Calculators can be used in CDS-290, but not on exams.

Software minimums:

- MS Office suite (or equivalent) is required for viewing classroom materials.
  (A free copy of MS Office 365 can be downloaded from GMU IT Services at: http://tsd.gmu.edu/services/office365/first-time.cfm)

- E-mail access to MasonNet e-mail account (Note: ONLY GMU.EDU e-mail accounts may be used in CDS-290. Other e-mail addresses will NOT be responded to.)

Scanning Capability:

For CDS-290, you may need to be able to scan a handwritten page(s) and then upload the scan to the Class Blackboard site to answer Excel and R programming problems. You are welcome to do this using the method that most available to you. Here is a listing of available methods that I am aware of:

1. Use a scanner (hardware item). At home I have an HP Printer that also scans.
2. Use a MASON scanner. While on MASON campus, you can use one of the Print Stations to scan a document and then e-mail it to yourself.
3. Use your Smartphone with a scanning software.
   - **For iPhone/IOS Devices:** You can use software called "**Evernote Scannable**". It is a free app that has been certified as safe to use on Mac devices. The software can be downloaded from:
   - Apple iTunes: https://itunes.apple.com/us/app/evernote-scannable/id883338188?mt=8
   - **For Android Devices:**
   - CNET Magazine recommends an app called "**CamScanner**". I am not familiar with this app, however CNET highly recommends it.
   - Google Store: https://play.google.com/store/apps/details?id=com.intsig.camscanner
   - While this app offers a "Premium Subscription for $5/month, I don't believe that you need an account to use it.
   - Another app, **IF** you already have the Adobe suite, is "Adobe Scan". It can be downloaded at: https://play.google.com/store/apps/details?id=com.adobe.scan.android I am not familiar with this app either.
4. **Other SCANNING software/hardware devices/methods are acceptable. HOWEVER, DO NOT TAKE PHOTOS** of the handwritten page or a screen on your computer. Photos are **EXTREMELY** hard to read, have low resolution when being reviewed by your Instructors on Blackboard to grade your submissions. Photos should **NOT** be used! Also, Photos are HUGE files that take long times to upload/download/open when using Blackboard. **DO NOT TAKE Photographs and submit them!**
5. When you submit a scan for an assignment, you can use the format .png, .jpg, .jpeg, .gif, and .pdf. The .jpg and .pdf file formats are **preferred**. Please note that unreadable scans will **NOT** receive any credit for that assignment!

PLEASE NOTE: There is a folder in tour Blackboard site called "Computer Check" that will allow students to check their computers to make sure that all of the above hardware and software is installed correctly. EVERYTHING in that folder MUST be completed PRIOR to beginning the work in Week #1.

Email Requirements:

- ALL e-mails to your instructors and STARS MUST be from your Mason Net e-mail account. E-mail from non-Mason e-mail accounts will NOT be responded to.
- All e-mails must contain "CDS 290" at the beginning of the Subject Line (**Note**: Your instructors teach other courses).

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- Mason Mail MUST be checked daily at a minimum for announcements, discussion inputs, or updates. Blackboard Announcements will send you an email when it is used.

E-mail Tips:

- Keep your mailbox maintained so that messages are not rejected for being over quota.
- You may forward your Mason e-mail to other accounts but always communicate with your instructors and your fellow students using Mason e-mail for verification of your identity and YOUR security.
- Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account. [See https://masonlivelogin.gmu.edu/].

R, Calculator, Blackboard, Email

- A scientific calculator is not required for this course. Graphing calculators and any calculator allowing text input will not be allowed on exams. Access to a computer capable of running Excel and/ or R is necessary for the homework and projects. The projects will require use of Microsoft Word. The GMU's computer labs provide these capabilities if they are open. The course Blackboard page will be used to post course documents and announcements. Login through the MASON BB LOGIN. You must use your GMU student email address for course-related correspondence. E-mail may also be used for important announcements such as weather related or emergency cancellations.

Grading

Final Course Numerical Grade / Final Course Letter Grade Correspondence

A+	> 97.00	C+	77.00 - 79.99
A	93.00 - 96.99	C	73.00 - 76.99
A-	90.00 - 92.99	C-	70.00 - 72.99
B+	87.00 - 89.99	D+	67.00 - 69.99
B	83.00 - 86.99	D	60.00 - 66.99
B-	80.00 - 82.99	F	<60.00

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Grading Items:

- "**Saturday Assignments also called Weekly Assignments (WA)**" (40%): Each week a set of assignment questions will be posted and are required to be completed by Saturday evening at 11:59pm.
    - "Saturday Assignments" are a combination of short answer, R and Excel programming problems. Assignments may be from anything covered in the course through that week but will mostly focus on that week's material.
    - One or more assignments will reach the level of a project. They will involve statistical analysis and require a detailed write-up. MS Word will be used to submit projects to Blackboard.
    - Your primary responsibility in this course is to learn the material in the lectures and the textbook and by doing the homework. If you do not have the discipline to do it, you will fail the course.
    - Your homework should be organized and brought to class and office hours. Your homework will be taken from problems from the Agresti, et. al. text and from the exercises in the Severini text and from problems defined on our blackboard site. If we begin a section of the Severini textbook in class, you should read that section by the beginning of the next class. A lecture might not cover all the material of a given section of our textbooks; however, you are responsible for all the material in a section unless I state otherwise.
    - The Agresti Student Solutions Manual provides worked-out solutions. Numerical answers are also provided in the back of the textbook. <u>When you submit your homework, you must show all the steps and calculations needed to solve the problem</u>. If you only hand-in the 'answer' you will receive no credit.
- "**Projects**" (20%):
    - There are two projects in CDS-290. The Greatest of All Time (GOAT) project and a project involving hypotheses tests and confidence intervals.
    - They will involve statistical analysis and require a detailed write-up. MS Word will be used to submit projects to Blackboard.
- **Midterm Exams** (20%**):**
    - The Midterm Exams will be a combination of multiple-choice, fill-in-the-blank, and short answer problems.
- **Final Exam** (20%):
    - The Final Exam will be a combination of multiple-choice, fill-in-the-blank, short answer, problems, and questions about Excel and R programming techniques which you have learned.
    - The Final exam will mostly focus on materials from the last half of the course but will cover materials from the entire course.
    - Exams will reflect the homework problems. <u>On exams you will be asked to show the necessary work and clear reasoning. If you do not do this, you may receive zero credit even if your conclusion is correct.</u>

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Comments on Grading:

- There is **NO** grade curve for this course. Assigned semester final grades are from the mathematical calculation of the earned credit.
- Important: We may use the RESPONDUS Lockdown Browser to take the Midterm and Final Exams with the video camera turned on. The Respondus Lockdown Browser allows you to take tests in a remote location. The exam sessions will be monitored and recorded. The RESPONDUS Lockdown Browser software can be downloaded at no cost via the class Blackboard site. If you have any privacy concerns, please contact me within the first week of class. (See the tab on the left side of our Blackboard site for details and instructions.)
- While correct answers are important, it is more important how you arrived at those answers. Completeness in answers (complete thoughts, complete codes, complete plots) is the most important part of the solution.
- Semester grades will be computed as a percentage of points earned divided by total points available in each category. Grades are mathematically determined and will **NOT** be curved.
- Assignments submitted after the published due date will be reviewed but will **NOT** receive a grade for the assignment. Time extensions are only given for extreme circumstances PRIOR to the start of week.
- There may be extra credit assignments/projects available for CDS-290. As of now, there is one: Quarterback Ratings.
- Students will be REQUIRED to show their GMU ID card PRIOR to beginning either exam on the webcam operating with the RESPONDUS Lockdown Browser. (Remember: "No GMU ID, No exam, No exception")! More details to follow.

Netiquette For Online Discussions[1][2][3]

- Class discussions should be collaborative, not combative; you are creating a learning environment, sharing information and learning from one another. Respectful communication is important to your success in this course and as a professional.
- Please re-read your responses carefully before you post them so others will not take them out of context or as personal attacks.
- Be positive to others and diplomatic with your words and I will try my best to do the same.
- Be careful when using sarcasm and humor. Without face-to-face communications your joke may be viewed as criticism.
- Experience shows that even an innocent remark in the online environment can be easily misconstrued.

1 Netiquette prepared by Charlene Douglas, Associate Professor, College of Health & Human Services, GMU.

2 https://oai.gmu.edu/mason-honor-code/full-honor-code-document/

3 https://oai.gmu.edu/faculty-resource-center/syllabus-language-2/ materials provided by Volgeneau School of Engineering

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Collaboration, Cheating, Plagiarism, Lying, and Stealing

- All members of the Mason community are expected to uphold the principles of scholarly ethics. On admission to Mason, students agree to comply with the requirements of the GMU Honor Code and System.
- Similarly, graduating students are bound by the ethical requirements of the professional communities they join.
- To uphold the rigor of the course and the value of your degree, the Honor Code will be rigorously enforced. The instructor will use several manual and automated means to detect cheating in all work submitted by students.
- All activities within all MASON courses are subject to GMU's Honor Code and IT policies.
- The penalty for cheating, plagiarism, lying, and stealing will always be far worse than a zero grade, to ensure it is not worth taking the chance.
- Any instance of misconduct that is detected can be referred to the Office of Academic Integrity (OAI) and will most certainly translate into a lowered grade at a minimum and may result in course failure (a final grade of F).

Honor Code Violations

- If you have questions about what does/does not constitute an Honor Code violation, contact your instructor for clarification.
- For this course, the following additional requirements are specified:
    - Students are encouraged to discuss course content with other current students; however, all programming assignment submissions must contain only original, individually completed work.
    - More specifically, if any student submission is deemed to be greater than or equal to 50% identical to another student's submission, the course content discussion that occurred constitutes misconduct and all students involved will be referred to OAI for violating the Honor Code.
    - Copying material from any source not specifically authorized by your instructor may result in a referral to OAI for misconduct for all students involved.
    - NO other electronic equipment (including phones of any type) may be used during any quiz or exam.
- Students are expressly prohibited from:
    - Receiving, giving, or showing another student a partial, completed, or graded solution.
    - Knowingly sharing computers or storage devices (e.g. USB drive). If work is stolen because of a shared or borrowed computer or storage device, all students involved will be held equally responsible.
    - Stealing another student's work by taking photographs, using a lost storage device, or gaining access to another student's work in any other way without their knowledge. This action represents a particularly egregious offense placing an innocent student in jeopardy of receiving an Honor Code violation. Any student who has stolen will be referred for two violations: cheating and stealing and will receive a sanction recommendation of at least course failure and a one-semester suspension.
    - Posting questions or a partial, complete, or graded solution on the Internet, even after the course has concluded.

- Incorporating program design, algorithm logic, or code found on the Internet.
- All work must be newly created by the student during this term. Work developed for another course, or for this course in a prior term, may not be used without prior instructor approval.
- Posting or sharing course content (e.g. instructor lecture notes, assignment directions, or anything not created by the student), using any non-electronic or electronic medium (e.g. web site) where it is accessible to someone other than the individual student constitutes stealing/copyright infringement and is strictly prohibited without prior instructor approval. Course materials are the copyrighted property of George Mason University, the College of Science, the Department of Computational and Data Science, the course professor and/or the textbook authors.

If you have any questions on these requirements, please discuss them with your instructor. Any deviation from these requirements is considered a violation.

Misconduct process

When the instructor for this section makes the determination that misconduct has occurred, the instructor shall:

• Notify the student that a potential misconduct incident has been identified. The student will be given a chance to provide explanation for their actions prior to the instructor's final determination that misconduct has occurred.

• For the first incident, the instructor shall:

o Record a grade of zero for the entire assignment or assessment,
o Issue a letter of warning/notification of misconduct to the student, and
o Report the incident to the Chair of the Computational and Data Sciences Department and the MASON Honor Committee for further adjudication and additional remedial action/sanctions.

Note: Student cannot receive credit for the course until the MASON Honor Committee process has concluded. Also, withdrawing from a course does NOT stop the Honor Committee process.

• For a second or third incident, the instructor shall:

o Repeat the recording and reporting as in the 1st incident,
o Recommend to the MASON Honor Committee that the student be assigned an automatic grade of "F" for the course and immediate removal from the course.

Note: Additionally, with a student's 2nd incident's referral to the MASON Honor Committee from any course in any term, the Honor Committee automatically recommends suspension from MASON. With a student's 3rd referral, the MASON Honor Committee automatically recommends expulsion from MASON.

Prohibited Equipment Use During Exams:

- RESPONDUS Lockdown Browser may be used with the video camera turned on.
- NO other electronic equipment (including phones of any type) may be used.

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Disability Accommodations

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu Phone: (703) 993-2474

If you have a documented learning disability or other condition that may affect academic performance students MUST:

- Have the need for accommodation on file with Office of Disability Services
- (SUB I, Rm. 4205; 703-993-2474; http://ods.gmu.edu);
- Provide the Instructor with a copy of the Office of Disability Services accommodation determination prior to receiving any accommodations. The Instructor will closely protect this information as private and will not share the information with anyone other than the class assistants unless authorized in writing by the student or the Office of Disability Services.
- PLEASE NOTE: If you are having ANY difficulties with CDS-290 due to personal limitations, PLEASE discuss them with your Instructor.

Diversity and Inclusion

The CDS Department seeks to create a learning environment that fosters respect for people across identities. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability. We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own.

Sexual Harassment, Sexual Misconduct, and Interpersonal Violence

George Mason University is committed to providing a learning, living and working environment that is free from discrimination and a campus that is free of sexual misconduct and other acts of interpersonal violence in order to promote community well-being and student success. We encourage students who believe that they have been sexually harassed, assaulted or subjected to sexual misconduct to seek assistance and support. University Policy 1202: Sexual Harassment and Misconduct speaks to the specifics of Mason's process, the resources, and the options available to students.

• As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX

Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434) or Counseling and Psychological Services (703-993-2380). You may also seek assistance from Mason's Title IX Coordinator (703-993-8730; titleix@gmu.edu).

Student Support Resources

The following resources are available to students:

- Counseling and Psychological Services
- The Learning Services Office or field-specific tutoring
- The Office of Diversity, Inclusion, and Multicultural Education (ODIME)
- University Career Services
- University Writing Center Information and links regarding these and other student support offices are available on our Student Support Resources on Campus page

We want to help you succeed in CDS-290 and in your GMU career!

Other Important GMU Dates:
https://registrar.gmu.edu/calendars/fall_2021/#