STA 2090: Quest 2
The Data Analytics Revolution in Sports

I. General Information

Class Meetings

- Spring 2026
- Tuesday Periods 2&3, Thursday Period 2 in TUR 1101

Instructor

- Beth Johnson
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- Office hours: Wednesday 1pm-2pm and by appointment
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Catalog Description

Explores the data-driven decision process within the field of athletics and game play using data analytics and visualization techniques. Compares the processes used in sports with those used in business and everyday life and illustrates examples of how data can be used to understand human behavior.

Course Description

"*Sport is a universal language. At its best it can bring people together, no matter what their origin, background, religious beliefs, or economic status. Sport can bridge difficulties. Sport can bridge cultures. Sport can bridge conflicts. Sport is the best school of life*." UN Secretary-General Kofi Annan, 2005.

Do people overestimate how much they know about the world and underestimate the role of chance in our lives? Are our subjective judgements biased? Are we too willing to believe findings based on too few observations and inadequate evidence? These are just a few of the questions posed in the book "Thinking, Fast and Slow" (Kahneman, 2011). In this course, students will explore these questions by focusing on the data analytics revolution in sports and determine if the lessons learned in that field can be applied to their own daily decision making. Students will investigate if the decision-making processes used in sports, such as how players and coaches make high stake decisions in sports-related activities, are similar to the procedures used by people and companies' to make daily decisions and judgements.

The successful use of data analytics and AI to make sports-related decisions has led to its incorporation into almost all sectors of our daily lives. This data driven process was highlighted in the publication of "Moneyball" (Lewis, 2004), a book that fundamentally altered the world of sports. This book tells the story of how the Oakland Athletics' adoption of a rigorous data-driven approach to assemble a baseball team, despite a limited budget, led them to the playoffs in 2002. Thereafter, data analytics and artificial intelligence (AI) transformed the way in which we consume and analyze all sports.

In this course students will learn how to use data analytics and visualization techniques to explore data on athletes and game play with the goal of advancing students' critical thinking and analytical skills as they 1) learn how data analytics and AI are being used to make innovations in all aspects of sports, 2) develop computing skills by analyzing and presenting sports data to illustrate how AI can be used to improve a process, such as recruitment or performance, and finally 3) reflect on how they use either data analytics or AI to make a personal decision in their life.

Throughout this course students will be shown how the statistical skills used to analyze sports-related data can be applied to decision-making processes in other data related fields, so they are equipped to think critically and ask questions as they engage with data and statistics in the world around them. These skills will empower students to use a data-driven approach as they engage with issues outside the classroom. Students will be shown examples which could include how the use of data and AI can be used to adopt healthy lifestyles, to investigate the impact of climate change, and to show how analytics can bring awareness to global public health issues. This course will show students how data can be used to understand human behavior and illustrate the relevance of statistics in their daily lives.

Students will be using statistical packages such as R and JMP Pro to conduct their analyses. No prior experience working with R or JMP Pro is necessary. R and R Studio are available as free downloads. JMP Pro is available as a free download from UF IT Software Licensing Services and on UF Apps.

Quest and General Education Credit

- Quest 2
- Social & Behavioral Sciences

This course accomplishes the [Quest](#) and [General Education](#) objectives of the subject areas listed above. A minimum grade of C is required for Quest and General Education credit. Courses intended to satisfy Quest and General Education requirements cannot be taken S-U.

Social and Behavioral Sciences (S): Social and behavioral science courses provide instruction in the history, key themes, principles, terminology, and underlying theory or methodologies used in the social and behavioral sciences. Students will learn to identify, describe, and explain social institutions, structures, or processes. These courses emphasize the effective application of accepted problem-solving techniques. Students will apply formal and informal qualitative or quantitative analysis to examine the processes and means by which individuals make personal and group decisions, as well as the evaluation of opinions, outcomes, or human behavior. Students are expected to assess and analyze ethical perspectives in individual and societal decisions.

Required Readings and Works

Introduction to Modern Statistics (Second Edition), Mine Cetinkaya-Rundel and Johanna Hardin, OpenIntro (2021), ISBN 9781943450213. This book may be downloaded for free at openintro.org/book/ims

Thinking, Fast and Slow, Daniel Kahneman, D. (2011). New York: Farrar, Straus, and Giroux

The Undoing Project, Michael Lewis (2017). Harlow, England: Penguin Books.

Movie: *Moneyball* (2011; 2hr 13 minutes). Can be viewed either free or with a small charge through various streaming services such as The Roku Channel, Amazon Prime, Goggle Play Movies, Apple TV, Vudu, Paramount+ or free through the UF Library System.

All other readings are available on the Canvas course site. **Journal articles may be updated as needed**. Materials and Supplies Fees: n/a

II. Graded Work

Description of Graded Work

Assignment	Description	Points
Attendance	Daily attendance will be recorded in the Canvas gradebook. You are allowed four "personal days" for the semester (one per class period), after which each absence that does not meet university criteria for "excused" will result in a two-point deduction from your final attendance score. Minimum score of 0.	5
Article Analysis 1	Online open notes quiz covering the article "Artificial Intelligence and Machine Learning in Sports Research: An Introduction for Non-data Scientists." Chmait and Westerbeek (2021)	2
Article Analysis 2	Online open notes quiz covering the article "Artificial Intelligence in Elite Sports – A narrative Review of Success Stories and Challenges." Hammes, Hagg, Asteroth and Link (2022)	2
Article Analysis 3	Online open notes quiz covering the article "Moneyball for the Wildland Fire System" by Thompson and Belval (2021)	2
Thinking, Fast and Slow (TFS): Readings and Discussions	Students will post reflections on selected sections of the TFS. These eight reflection posts will have a prompt to help direct responses and will aid in-class discussions. Such as, "describe an example of the use of both the System 1 and System 2 decision-making process in your own life."	8
The Undoing Project(TUP): Readings and Discussions	Students will post four reflections on selected sections TUP. These reflections will have a prompt to help direct responses and will aid in-class discussions. Such as, "describe a situation in which a bias may have impacted your decision making."	4
In-class Lab 1	Students will learn how to use a statistical software package to enter and manipulate data.	3
In-class Lab 2	Students will collect *categorical data* and use a statistical software package to conduct an analysis including appropriate visualizations and interpretations of results.	3

In-class Lab 3	Students will collect *quantitative data* and use a statistical software package to conduct an analysis including appropriate visualization and interpretations.	3
Project 1	Students will use a data set to investigate the question, "Do the distributions of host countries by continent for the Summer Olympic Games and FIFA World Cups differ?"	5
Project 2	Students will use a data set to investigate the question, "What is the average time it takes a runner to finish a marathon?"	5
Project 3	**By *attending a live UF sporting event**, students will collect data of choice. Students will analyze their data, to include an appropriate visualization and interpretations. Students will present their findings to the class either with in-class or short video presentation.	10
Project 4	Students will use a data set to investigate the association between two variables and identify any outliers when comparing player performance of different eras.	5
Project 5	Students will use a data set to investigate the question, "What variable(s) can help to predict the length of a Major League Baseball game?"	5
Self-reflection	In two pages, describe an occasion where you have used data to make a decision in your own life. See rubric for complete details.	8
Exam 1	This in-class, multiple choice and short answer, exam will cover the topics from Weeks 1-7. Students will be provided with a formula sheet and any necessary statistical tables.	15
Exam 2	This in-class, multiple choice and short answer, exam will cover the topics from Weeks 8-15. Students will be provided with a formula sheet and any necessary statistical tables.	15
Total Points		100

Note: Project topics and articles may vary each semester but will cover the same course content.
*Student attendance at most UF sporting events is free but some events required a student pass which can be obtained at Florida Gator Student Tickets as well as a schedule of upcoming events and policies.

Grading Scale

For information on how UF assigns grade points, visit: https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

A	94 – 100%		C	74 – 76%
A-	90 – 93%		C-	70 – 73%
B+	87 – 89%		D+	67 – 69%
B	84 – 86%		D	64 – 66%
B-	80 – 83%		D-	60 – 63%
C+	77 – 79%		E	<60

Your final overall numeric score is rounded to the nearest integer. So, for example, if your average is 76.4 your grade will be 76. If your grade is 76.5, your grade will be 77.

Grading Rubric for Self-Reflection

Grading Criteria	Points
Describe completely an occasion where you used data to make a decision in your own life. Be specific about the type of data that you used for this decision.	2
Include a list of any biases in the data that may have affected your original decision.	1
Provide at least <u>two</u> examples of how the knowledge or skills acquired on this course has enabled you to now make a more reasoned or stronger decision.	4
The paper should be proofread and be error-free. Spelling, punctuation, and/or grammatical errors should not detract from the overall paper.	1

III. Annotated Weekly Schedule

Week	Topics, Homework, and Assignments
Week 1	**Topic:** What is Moneyball? **Summary: How is the process of decision making affected by biases of intuition.** We will explore the method of *Moneyball* by viewing the 2011 film. Students will then discuss key aspects of the film and its relationship to the decision-making process in baseball and in other fields of study. **Required Readings**: • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), pages 3-19 • *The Undoing Project*, Michael Lewis (2017), pages 15-20 **Assignment:** Watch the film *Moneyball* (first 60 minutes) due at the end of Week 1. Post TFS#1 reflection.
Week 2	**Topic:** Can we use (and trust) data to make decisions? **Summary: Is the way we process information impacted by our system of thinking?** We will continue to watch the film *Moneyball,* and students will discuss how the use of data to make decisions impacted various members of the management team based on their past experiences and knowledge of the game. **Required Readings**: • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), pages of 19-30. • Journal Article #1, "Artificial Intelligence and Machine Learning in Sports Research: An Introduction for Non-data Scientists." Chmait and Westerbeek (2021), posted on Canvas. **Assignment:** Watch the film *Moneyball* (last 73 minutes) due by the end of Week 2 and TFS#2 and TUP#1 reading reflection posts.

Week 3	**Topic:** Artificial Intelligence in Sports **Summary: What biases might distort our judgement?** We will introduce various devices that are used to collect data on players in sports and discuss devices that students use to collect health-related data on themselves, such as Fitbits. The required reading assignments support the discussion on how we use personal data to make decisions. **Required Readings:** • *The Undoing Project*, Michael Lewis (2017), pages 21-52. • Journal Article #2, "Artificial Intelligence in Elite Sports – A narrative Review of Success Stories and Challenges.", by Hammes, Hagg, Asteroth and Link (2022) pages 1-4, posted on Canvas. **Assignment:** Complete Online Journal Article Quiz #1 due by end of Week 3. Post TUP#2 reading reflection post.
Week 4	**Topic:** Using Data **Summary: What circumstances might lead us to make intuitive errors?** An introduction on how to classify, collect, organize, and store data using examples from various disciplines. In class we will watch a short video from the Against All Odds series titled "What is Statistics", https://www.learner.org/series/against-all-odds-inside-statistics/ which illustrates many different fields where statistics and data is used to make decisions. **Required Readings:** • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), pages of 79-88 • Journal Article #2, "Artificial Intelligence in Elite Sports – A narrative Review of Success Stories and Challenges.", by Hammes, Hagg, Asteroth and Link (2022) pages 5-8, posted on Canvas. • Introduction to Modern Statistics, pages 12-21 **Assignment:** In-class Lab #1 due by the end of Week 4. Post TFS#3 reflection post.
Week 5	**Topic:** The importance of using the proper study design **Summary: What causes errors in causal conclusions?** We will compare observational studies to designed experiments and discuss how this difference impacts causal conclusions. Examples from various disciplines will be highlighted. **Required Readings:** • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), pages 109-118 • Journal Article #2, "Artificial Intelligence in Elite Sports – A narrative Review of Success Stories and Challenges.", by Hammes, Hagg, Asteroth and Link (2022) pages 9-12, posted on Canvas. • Introduction to Modern Statistics, pages 31-44 **Assignment:** Complete Online Journal Article Quiz #2 by end of Week 5. Post TFS#4 reading reflection post.
Week 6	**Topic:** Exploring Categorical Data **Summary: Why is there a deep gap between thinking about statistics and thinking about individual cases?** We will learn how to summarize important features of categorical data using contingency tables and visualizations. Students will discuss the importance of clearly communicating statistical findings to lay audiences. **Required Readings:** • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), Pages 166-174 • Introduction to Modern Statistics, pages 61-67

	Assignment: In-class Lab#2 by the end of Week 6. Post TFS#5 reading reflection post.
Week 7	**Topic:** Exploring Categorical Data **Summary: Why is it so difficult to think statistically?** We will continue our exploration of important features of categorical data using contingency tables and visualizations. We will discuss the importance of the clear communication of statistical findings to provide stakeholders with the needed information to base a decision. **Required Readings/Works**: • Introduction to Modern Statistics, pages 67-72 **Assignment:** Project #1 due by the end of Week 7.
Week 8	**Topic:** Exploring Numerical Data **Summary: What is the difference in clinical and statistical predictions?** Visualizing numerical data using dot plots, boxplots, and histograms. Examples from various disciplines will be highlighted. **Required Readings**: • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), Pages 222-233. • Introduction to Modern Statistics, pages 76-82 **Assignment:** Exam 1 covers material from Weeks 1-7. Post TFS#6 reading reflection post.
Week 9	**Topic:** Exploring Numerical Data **Summary: What is the process of decision making?** Lectures on **s**ummarizing important features of numerical data including measures of shape, center, spread and position (z-scores) and how these summary statistics can be used to make decisions or comparisons. **Required Readings**: • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), pages 269-277 • Introduction to Modern Statistics, pages 83-94. **Assignment:** In-class Lab#3 due by end of Week 9. Post TFS#7 reading reflection post.
Week 10	**Topic:** Probability Rules **Summary: How do people make predictions in their lives?** Discussion on probability and odds, and the influence these concepts play in our everyday lives. In class we will watch a short video from the Against All Odds series titled "Introduction to Probability ", https://www.learner.org/series/against-all-odds-inside-statistics/introduction-to-probability/ which shows how the use of probability impacts our daily lives and how people "calculate" their personal odds of success. **Required Readings/Works**: • *The Undoing Project*, Michael Lewis (2017), pages 194-211 • Supplemental Notes will be posted on Canvas. **Assignment:** Project #2 due by the end of Week 10. Post TUP#3 reading reflection post.
Week 11	**Topic:** Probability Rules **Summary: Can overconfidence lead to incorrect decisions?** Students will distinguish between discrete and continuous random variables and be able to apply either a Normal or Binomial model to find probabilities. Applications to various disciplines will be highlighted to illustrate how to use the correct data to make decisions. **Required Readings**:

	• *The Undoing Project*, Michael Lewis (2017), pages 217-229 • Supplemental Notes will be posted on Canvas. **Assignment:** Project #3 due by the end of Week 11. Post TUP#4 reading reflection.
Week 12	**Topic:** Regression Modeling **Summary: Correlation does not imply causation!** Students will explore associations between numerical variables graphically using scatterplots and numerically using correlations to illustrate the importance of making the correct conclusions using data/ **Required Readings**: • Journal Article #3, "Moneyball for the Wildland Fire System" by Thompson and Belval (2021), posted on Canvas. • Introduction to Modern Statistics, pages 112-124 **Assignment:** Complete Online Journal Article Quiz #3 due by end of Week 12. This quiz will require you to use data from the website https://ourworldindata.org/ to find and critique a data visualization.
Week 13	**Topic:** Regression Modeling **Summary: What is meant by regression to the mean?** Students will model linear trends using least squares regression. Applications to various disciplines will be highlighted. **Required Readings**: • Introduction to Modern Statistics, pages 124-136. • *Thinking, Fast and Slow*, Daniel Kahneman, D. (2011), pages 175-184 **Assignment:** Project #4 due by the end of Week 13. TFS#8 reflection post.
Week 14	**Topic:** Regression Modeling **Summary: "All models are wrong, but some are useful."** Students will consider models with two or more predictor variables. **Required Readings**: • Introduction to Modern Statistics, pages 150-164. **Assignment:** Project #5 due by the end of Week 14.
Week 15	**Topic:** Understand how AI and Data Analytics impacts decision making **Summary: What have we learned?** We will discuss how AI and data analytics techniques are used in a multitude of settings and how they impact our personal lives. Discussion of how the "Moneyball" principle has impacted society. **Assignment:** • Self-reflection paper due by the end of Week 15 • Exam 2 covers topics from Weeks 8-15

IV. Student Learning Outcomes (SLOs)

At the end of this course, students will be expected to have achieved the Quest and General Education learning outcomes as follows:

	Social & Behavioral Sciences SLOs Students will be able to…	*Quest 2 SLOs* Students will be able to…	*This course's SLOs* Students will be able to…	*Assessment* Student competencies will be assessed by …
Content*: Students demonstrate competence in the terminology, concepts, theories, and methodologies used within the discipline(s).*	**Identify, describe, and explain** key themes, principles, and terminology; the history, theory and/or methodologies used; and social institutions, structures, and processes.	**Identify, describe, and explain** the cross-disciplinary dimensions of a pressing societal issue or challenge as represented by the social sciences and/or biophysical sciences incorporated into the course.	**Identify** the appropriate methods used to collect data and **describe** how statistics and/or probability concepts are used to support the decision-making process in a variety of fields, including personal decisions. **Interpret** quantitative information (i.e., graphs, tables, models) **and explain** how appropriate **conclusions** can be drawn.	Applying their skills on the proper use of data in decision making, including how to make appropriate decisions, to three in-class labs and five mini-projects. Participating in class discussions covering concepts and **methodologies** related to biases in decision making as illustrated by the required book readings. Identifying the proper **terminology and important concepts** gained from the course by taking two exams during the semester.
Critical Thinking: *Students carefully and logically analyze information from multiple perspectives and develop reasoned solutions to problems within the discipline(s).*	**Apply** formal and informal qualitative or quantitative analysis effectively to examine the processes and means by which individuals make personal and group decisions. **Assess and analyze** ethical perspectives in individual and societal decisions.	**Critically analyze** quantitative or qualitative data appropriate for informing an approach, policy, or praxis that addresses some dimension of an important societal issue or challenge.	Formulate a problem quantitatively and use appropriate statistical methods to solve the problem. **Evaluate logical arguments** using quantitative reasoning	Constructing data visualizations and statistical results from class activities to explore how to **assess decision-making** with data. Discussing how people make decisions based on information. Writing a self-reflection paper on how they have used data to make decisions.

	Social & Behavioral Sciences SLOs Students will be able to…	Quest 2 SLOs Students will be able to…	This course's SLOs Students will be able to…	Assessment Student competencies will be assessed by …
Communication: *Students communicate knowledge, ideas, and reasoning clearly and effectively in written and oral forms appropriate to the discipline(s).*	**Communicate** knowledge, thoughts, and reasoning clearly and effectively.	**Develop and present** clear and effective responses to essential questions in oral and written forms as appropriate to the relevant humanities disciplines incorporated into the course.	**Communicate and present** quantitative results effectively to lay audiences.	Writing and presenting results of their statistical findings from a class activity in which they collect their own data from a UF sporting event. Discussing how the use of data informs their decision-making process.
Connection: *Students connect course content with meaningful critical reflection on their intellectual, personal, and professional development at UF and beyond.*		**Connect** course content with critical **reflection** on their intellectual, personal, and professional development at UF and beyond.	Adapt the methods used to analyze sports data to decision-making in other areas of their life.	Writing a self-reflection paper in which they describe how data analytics may be applied to personal decision-making.

V. Quest Learning Experiences

1. Details of Experiential Learning Component

Students who are cognitively engaged develop a conceptual understanding that is fundamental in applying quantitative techniques of analysis to real life problems. This course utilizes a series of guided projects to allow students to learn by doing. One of these guided projects requires students to attend a live sporting event and collect, analyze and present data from this experience.

2. Details of Self-Reflection Component

The self-reflection component in this course encourages students to consider how some of the concepts studied apply to their own decision-making experiences, what are the implications of the class material on their knowledge, and how this may impact any future decisions. While the course is structured in ways to provide students plenty of opportunities for reflecting on these key questions throughout the semester, this assignment is the main self-reflection component. In a few pages, students will have to demonstrate the extent to which they have thought about the class material and how this may impact their knowledge and future actions.

VI. Required Policies

Attendance Policy
Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Students Requiring Accommodation

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

UF Evaluations Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

University Honesty Policy

University of Florida students are bound by the Honor Pledge. On all work submitted for credit by a student, the following pledge is required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Student Honor Code and Conduct Code (Regulation 4.040) specifies a number of behaviors that are in violation of this code, as well as the process for reported allegations and sanctions that may be implemented. All potential violations of the code will be reported to Student Conduct and Conflict Resolution. If a student is found responsible for an Honor Code violation in this course, the instructor will enter a Grade Adjustment sanction which may be up to or including failure of the course.

Counseling and Wellness Center

Contact information for the Counseling and Wellness Center: http://www.counseling.ufl.edu/ , 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

The Writing Studio

The writing studio is committed to helping University of Florida students meet their academic and professional goals by becoming better writers. Visit the writing studio online at http://writing.ufl.edu/writing-studio/ or in 2215 Turlington Hall for one-on-one consultations and workshops.

In-Class Recordings

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.