

COL 150.02 & .03 – Fall 2025 – Syllabus

Using Data in Business

Professor

Dr. Morgan Wood

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Professor's Office Hours (Tentative)

Braswell, Room 176

For Course Material:

Mondays 11:30 AM – 12:30 PM

Tuesdays 1:00 PM – 2:00 PM

For Grading Concerns: (schedule in advance)

I always have Wednesdays from 11:30am-12:30pm set aside for this purpose. We can meet in person or over zoom. Email me to reserve this time.

Resources/Textbook

There is no required textbook for this course. However, free textbooks 'Introduction to Modern Statistics' by OpenIntro as well as 'R for Data Science' are great resources that cover many of the topics that we will discuss. They can be found at:

<https://www.openintro.org/book/ims/>

<https://r4ds.hadley.nz/>

I will keep a running list of additional resources on our class page. Stay tuned for updates to this.

Course Overview

Intended for first-year students at NCWU, this course is designed to invite students to participate in the university's academic life through the study of a discipline-specific issue, problem, or topic of interest. Taught by a member of NCWU's full-time faculty, the course will introduce students to a scholarly discipline through a specialized topic in which the faculty member possesses interest and expertise. Designed for students with little or no prior college experience, the course will also introduce and develop habits of mind that will help to foster success throughout students' careers at the university.

This course, in particular, will serve as an introduction to modern data science techniques that can be used in business decision-making. These topics are either broad or advanced in nature, so instead of going into depth, we will only break the surface while giving a gentle introduction to each of the following topics: Data exploration (and basic coding), Simulation, Modeling using Machine Learning, Reinforcement learning, and Ethics.

Class Location & Time

Section 2:

MWF 10:20 AM – 11:20 AM

D01 GSC, Room 210

Section 3:

TTh 11:20 AM – 12:50 PM

D01 BRA, Room 235

Grading

Assignment	Percentage	A	93 or above	C+	77 to 79.99
Quizzes	20%	A-	90 to 92.99	C	73 to 76.99
Homework	40%	B+	87 to 89.99	C-	70 to 72.99
Final Report & Presentation	20%	B	83 to 86.99	D+	67 to 69.99
Attendance & Participation	20%	B-	80 to 82.99	D	60 to 66.99
				F	Below 60

*There will be no formal exams in this course. The final exam period will be used for final presentations, instead.

Material that will be Covered

Chapter	Subject
Chapter 0	Introduction to Data & Coding
Chapter 1	Data Exploration & Visualization
Chapter 2	Predictive Modeling
Chapter 3	Simulation
Chapter 4	Reinforcement Learning
Chapter 5	Data Ethics & Bias

Course Objectives

0. Understand the scope of data science
 - a. Describe what data is, why it is important, and how it is applied in various fields.
 - b. Navigate RStudio and write basic R code for data manipulation and visualization.
1. Explore and visualize data
 - a. Summarize datasets using descriptive statistics.
 - b. Create and interpret visualizations such as histograms, scatter plots, and heatmaps.
 - c. Identify patterns, trends, and potential data quality issues through exploratory analysis.
2. Apply predictive modeling techniques
 - a. Distinguish between classification and regression problems.
 - b. Build and interpret decision trees and random forests for categorical outcomes.
 - c. Evaluate model performance using appropriate metrics.
3. Simulate systems using entity-based modeling
 - a. Explain the purpose and applications of simulation.

- b. Generate and use random numbers in simulation contexts.
- c. Build and analyze simple entity-based models in R and Arena.
- d. Compare system designs (e.g., pooled vs. dedicated resources) using simulation results.
- 4. Implement a simple reinforcement learning approach
 - a. Explain how trial-and-error learning works in AI.
 - b. Apply the exploration vs. exploitation trade-off in decision-making.
 - c. Implement and interpret a basic multi-armed bandit algorithm.
- 5. Recognize and address ethical issues in data science
 - a. Define fairness, privacy, and transparency in data-driven decision-making.
 - b. Identify sources of bias in datasets and algorithms.
 - c. Assess the potential real-world consequences of biased models.
- 6. Synthesize skills through a collaborative capstone project
 - a. Select and investigate a real-world dataset or problem.
 - b. Apply course concepts to analyze, model, and present findings.
 - c. Communicate results clearly through both a written report and an oral presentation.

SPOKEN COMMUNICATION. Students will apply public speaking practices and/or create presentations based on their own thoughts and/or research.

Class Schedule

A tentative up-to-date schedule for lecture topics, quizzes, homeworks, and more is posted on our course page. I will communicate any changes with you as soon as possible. Please be aware that the goal is to lecture at least at the pace outlined in this original schedule below. Extra time will be filled with relevant topics or review lectures.

Tentative Original Course Schedule

Week	Chapter	Homework (due @ end of "week")	Topics
1. Aug 20 – Aug 26	0. Intro to Data & Coding Basics	Download R, Register for any needed or wanted accounts	What is data? What is coding? Variables, vectors, strings Reading in data An interactive coding exercise
2. Aug 27 – Sept 3	1. Data Exploration & Visualization	Coding Basics & Visualization (Part 1 of 2: Coding and reading in data)	Descriptive statistics ggplot & dplyr Histograms & Scatterplots Categorical vs Numerical data

			How to edit existing code to get what you want
3. Sept 4 – Sept 10	1. Data Exploration & Visualization	Coding Basics & Visualization (Part 2 of 2: Editing existing code)	Same as above but with more advanced plots (box plots & heat maps) Fitting a trend line <i>Quiz 1</i>
4. Sept 11 – Sept 17	2. Predictive Modeling	Modeling (Part 1 of 3: Linear Regression)	Linear Regression Categorical vs Numerical data Logistic Regression
5. Sept 18 – Sept 24	2. Predictive Modeling	Modeling (Part 2 of 3: Mini-project)	Decision Trees Pruning
6. Sept 25 – Oct 1	2. Predictive Modeling	Modeling (Part 3 of 3: Decision Trees and RF Models)	Random Forest Models <i>Quiz 2</i> Talk about Final project (and Extra Credit) Assign groups & 15 min in class to work
7. Oct 2 – Oct 12	3. Simulation	Simulation (Part 1 of 3: RN Simulation w visualization)	Intro to Simulation RN Generation Basic Event-based Simulations
8. Oct 13 – Oct 19	3. Simulation	Simulation (Part 2 of 3: Simulating in R)	Intro to Arena (entity-based simulation)
9. Oct 20 – Oct 26	3. Simulation	Simulation (Part 3 of 3: Simulating in Arena)	Replications (independent observations) & tying this back into visualization (Case: pooled vs dedicated servers) <i>Quiz 3</i>
10. Oct 27 – Nov 2	4. Reinforcement Learning	Work on your final project (Homework will be to type up a paragraph of what your group accomplished and where to go from here)	Learning vs earning trade-off AI & how machines learn Single & multi-armed bandit

11. Nov 3 – Nov 9	4. Reinforcement Learning	RL (Part 1 of 1: Multi-armed Bandits)	Option 1: States & Actions; Looking at and reading RL Code and examples Option 2: Working on project in-class <i>Quiz 4</i>
12. Nov 10 – Nov 16	Writing Reports & 5. Ethics	Work on your final project (no homework)	Good report-writing Case-studies of ethical issues
13. Nov 17 & Nov 18	5. Ethics	Final Reports	Case-studies of ethical issues
14. Final Exam	Capstone Presentations	Final Presentations	Group Presentations (aim for 10 minutes each) – (If you are missing, you will be required to pre-record or zoom-in for your part) Peer Rating of Groups

Homework Policy

The due dates for homeworks can be found above as well as on our course website. There will be no dropped homeworks. However, if you are not able to complete the homework on time, you are able to request an extension. An extension will be granted for up to 3 days (72 hours). Any work completed during this extended period will earn 50% of the original credit. The only exception to this penalty is for excused absences on the due date. I will extend the homework assignment for as many days that are excused. To ask any private questions about grading, feel free to schedule some time with me during my “Administrative” Office Hour.

Quiz Policy

Rather than implementing high-stakes exams, this course will implement 4 lower-stakes quizzes at the end of Chapters 1 through 4. Each quiz is worth 5% of your grade and can be retaken a second time to improve your score, if desired. All quiz retakes must be scheduled before November 16th.

Final Report & Presentation

More information on this project will be released later in the semester.

The completion of this group project will entail applying some of the techniques learned within this class to a business decision. You will be required to write up your problem and results in a report as well as present on this project to the class. This presentation will be mandatory for all students to attend. If you cannot attend (for an approved reason), you will still be required to either pre-record your portion of the presentation or virtually attend

the presentation. Missing this presentation for an unapproved reason will result in a zero for the presentation portion of this assignment.

While I will give you more information on this project throughout the semester, for now, you should be aware that you will be able to choose your own problem and proposed solution (cleared by me). You're also free to use AI here to help you along. However, you are responsible for all material and understanding of the project. Both your classmates (and I) will have the opportunity to ask you questions about your reasoning and results during your presentation.

Attendance & Participation

Class is in-person and required because of the value of in-class discussions. However, I understand that sometimes, things come up. You can miss up to 10% of classes (without an excuse) without this hurting your attendance. (2 classes for T/TH courses, 3 classes for M/W/F courses). For further absences, these will need to be approved with me prior to the absence or within 24 hours of the absence.

Up to 5% of the 20% can be lost from your participation grade if you are physically present in classes, but your engagement in class discussions is lacking.

If you miss the first 15% of class meetings (first 3 classes for T/TH courses, first 5 classes for M/W/F courses) or if you miss more than 25% of the total class meetings (5 classes for T/TH courses, 8 classes for M/W/F courses), I reserve the right to withdraw you from the course.

Email Communication

Outside of face-to-face communication, we will be primarily communicating through email. As such, there are expectations for both you and me. All emails should be sent through your NCWU email account; this is to ensure that we can both guarantee that we are who we say we are. You will never get an email from me from any other email than: mwood@ncwu.edu. As emails will often contain time-sensitive matters (announcements from me and questions from you), we should both strive to check and respond to all emails within 24 hours during the weekdays.

AI Use

I expect the use of AI in this class by many students, which is perfectly fine. However, note that you are responsible for understanding all the material we cover in class as well as any material you turn in (homework, report, etc). I reserve the right to give a zero for any assignment where the student cannot tell me what they did and why.

Mental Health

I am a huge supporter of mental health awareness and would like to be available to you if you need me. I was Mental Health First Aid (MHFA) certified which covers helping you through an immediate mental health crisis (suicidal idealizations, hallucinations, delusions, etc). However, please be aware that I am a mandated reporter. If I believe that someone is considering killing themselves, a crime has been committed (including sexual assault

and harassment), or a crime will likely be committed, I must report this to the university. The university has assured me that the goal will be to resolve the issue and remedy any lasting effects. If possible and if you wish, issues are attempted to be handled in-house by the university rather than using the Rocky Mount Police Department. If you would like to talk to a confidential source, I am happy to help you get in contact with one.

The Office of Counseling & Accessibility Services

North Carolina Wesleyan University seeks to fully comply with the Americans with Disabilities Act (ADA). The purpose of Accessibility services is to provide equal access opportunities, including the establishment and coordination of academic accommodations, auxiliary aids, and programs to qualified students in accordance with Section 504 of the Rehabilitation Act of 1973 and Americans with Disabilities Act of 1990. The office of Counseling and Accessibility Services exercises a reasonable good faith effort to coordinate accommodations to enable students with disabilities to maximize their educational potential.

For complete information on support available for students with disabilities at NC Wesleyan University, please email accessibility@ncwu.edu for more information.

Inclement Weather

In the event of a weather or other emergency, information about the status of classes at NCWU will be posted on the NCWU home page (www.ncwu.edu) and distributed to major TV and radio stations in the area.

Statement on Academic Honesty

The professor and students share responsibility for the integrity of the academic process. The definition of cheating is “giving or receiving of information illicitly with intent to deceive the instructor in his or her effort to grade fairly any academic work,” and the definition of plagiarism is “to take and use as one’s own the thoughts, writings, or inventions of another” (Oxford English Dictionary). It is plagiarism when one uses direct quotations without proper credit and appropriate quotation marks, and when one uses the ideas of another without proper credit. The penalty for academic dishonesty is severe. (Refer to the university catalog)

Classroom Behavior

It is important that we have a classroom atmosphere that optimizes teaching and learning, and we all share the responsibility for creating a civil and non-disruptive forum. Students are expected to always conduct themselves in a manner that is respectful of differing viewpoints and does not disrupt teaching or learning. Behavior which disrupts the learning process may lead to disciplinary action and/or removal from class as specified in university policies.

Syllabus Changes

The professor reserves the right to make changes to the syllabus including project due dates and test dates. These changes will be announced as early as possible.