Course Syllabus: Methods In Data Science

**TEXTBOOK:**

* An Introduction to Statistical Learning with Applications in Python by Gareth James (Springer, 2023) ([Download Link for Free](https://www.statlearning.com/))
* My [GitHub](https://github.com/mohsentabibian/LeetCode-Solutions) repository (LeetCode-Solutions repository)

**IMPORTANT DATES**:

Last Add Date August 23

Last Drop Date October 23

Final Exam December 6, 2024, 8:00 – 10:00 AM (**No Final Exam**)

**PURPOSE AND OBJECTIVE:** The purpose of this course is to equip students with advanced tools and techniques in Data Science and Analytics, enabling them to tackle complex real-world problems with sophisticated methods. The objective is to deepen students' understanding of specialized analytical approaches, including statistical regression, machine learning models, and optimization techniques, and to provide practical experience through hands-on exercises and projects. By exploring a range of topics such as Geographic Information Systems, Econometrics, and Business Analytics, the course aims to develop students' ability to manage and interpret diverse datasets, validate models, and apply data-driven insights to inform decision-making. Ultimately, students will gain the expertise needed to excel in various data science roles and contribute effectively to the field's evolving challenges.

**MATERIAL TO BE LEARNED:** In this course, students will focus on foundational data science techniques and tools. They will learn about essential statistical methods, such as regression analysis, which helps in understanding relationships between variables and making predictions. The course will cover optimization techniques used to enhance model performance and solve various problems. Students will gain skills in handling missing or inconsistent data and learn methods for validating models, such as bootstrapping and cross-validation. Additionally, the course will include practical applications of Multivariate Regression, providing a solid foundation in straightforward and effective data analysis techniques.

**EVALUATION:** **GRADING SCALE:**

Homework 60% A 93-100% A- 90-92% B+ 87-89%

Final Project 30% B 83-86% B- 80-82% C+ 77-79%

Class Participation 10% C 73-76% C- 70-72% D+ 67-69%

D 60-66% F < 60%

**PREREQUISITES:** DT 320 or permission of professor

**ACADEMIC INTEGRITY AND ATTENDANCE POLICY:** Upholding academic integrity is paramount in this course, with severe consequences for violations. Plagiarism, cheating, and unauthorized collaboration can lead to failing grades for assignments or exams and referral for judicial review. Additionally, more than three unexcused absences will significantly impact your grade, and excessive absences may lower it naturally. It is essential to communicate in advance about any absence, providing a valid reason and documentation for excused absences. Quizzes and exams require students to show their work for full credit, emphasizing clarity in expressing calculator processes if used extensively. Cell phone use, including texting, is strictly prohibited. Familiarizing yourself with the current Student Handbook is crucial for understanding academic integrity policies, examination procedures, and the attendance policy, especially regarding excused absences, classroom behavior, and the process for handling academic misconduct charges. Adhering to these policies ensures a fair and enriching educational experience for all.

OFFICE HOURS:  MWF 12:30 - 2:15, online via [Zoom](https://wilmington.zoom.us/j/82033719126?pwd=biitdY2X3JRQyaIFwdLbdyegAz2Maa.1). Other times can be arranged on request.

**COURSE DELIVERY:** This course is designed to be delivered online in a synchronous format. Communication will be facilitated through [Zoom](https://wilmington.zoom.us/j/84887435077?pwd=7MDvzXibRBexssq6YzFMtuUbl4jHAW.1), and all sessions will be recorded to assist students with limited internet connectivity and to allow for later review of the material if necessary. Any required presentations can be conducted via Zoom or submitted as recorded videos. This adaptable approach ensures the integrity of the learning experience is upheld, regardless of the delivery mode.

**Platform and Access:** Classes will be held via [Zoom](https://wilmington.zoom.us/j/84887435077?pwd=7MDvzXibRBexssq6YzFMtuUbl4jHAW.1).

**Course Workload and Expectations:** To support your success in this course, please be aware that a minimum of two hours of out-of-class student work is expected for each hour of in-class time. This means that for every hour spent in class, you should plan to dedicate approximately two additional hours outside of class to complete assignments, study, and engage with course materials. This expectation ensures that you have ample time to grasp the concepts and complete homework and the final project.

HOMEWORK POLICY: Homework assignments play a crucial role in reinforcing concepts learned in class and promoting individual understanding. In this course, the following policies govern homework submissions and assessments:

1. **Timely Submission:** All homework assignments are expected to be submitted by the specified deadline. Late submissions may result in a deduction of points, with the severity of the penalty increasing the longer the delay.
2. **Minimum Homework Score:** The lowest homework score will be dropped from the total, which allows for flexibility and accommodates any challenges you may face.
3. **Quality and Originality:** Homework solutions should reflect individual effort and understanding. Plagiarism or copying from external sources is strictly prohibited and will result in academic consequences.
4. **Clarity and Organization:** Clear presentation of solutions and organized work are essential. Use proper formatting, labeling, and explanations to ensure that your responses are easily understandable.
5. **Collaboration:** Unless explicitly stated otherwise, homework assignments are to be completed individually. Unauthorized collaboration may lead to academic penalties.
6. **Grading and Feedback:** Assignments will be graded based on correctness, completeness, and adherence to instructions. Constructive feedback will be provided to aid in your understanding and improvement.
7. **Resubmission:** In certain cases, resubmission of corrected assignments may be allowed after receiving feedback. However, this is at the discretion of the instructor and may be subject to specific guidelines.

**EXTRA CREDIT:** Occasionally, I may offer extra credit opportunities in addition to regular homework assignments. Each extra credit task completed will earn you one extra point, which will be added to your final grade average at the end of the term.

**CATALOG DESCRIPTION:** A deep dive into specific tools and methods used in Data Science and Analytics.

Topics will vary to match student needs and faculty expertise and may include Statistical Regression, Linear and Nonlinear Optimization, and Artificial Neural Networks.

**Learning Outcomes:**

* Students can apply sophisticated data analysis techniques to gain insight into real-world data
* Students can set up, train, and use standard models in machine learning, such as Decision Trees, Random Forest, Artificial Neural Networks, etc.
* Students are familiar with techniques for dealing with inconsistent or incomplete data sets
* Students are familiar with model validation techniques, such as bootstrapping, cross-validation, etc.
* Other skills and topics based on student interest and faculty expertise, such as Multivariate Regression and Linear and Nonlinear Optimization.

**SKILLS:** Students will develop advanced skills in Data Science and Analytics. They will gain expertise in applying Statistical Regression techniques to analyze and interpret complex data relationships. Students will learn to implement Linear and Nonlinear Optimization methods to address a range of analytical problems and enhance model performance. The course will also cover various machine learning models, equipping students with the skills to build, train, and evaluate these models effectively. Additionally, students will refine their abilities in handling and visualizing data, ensuring they can draw actionable insights and make informed decisions based on their analyses.