Course Syllabus
CIS 508 Machine Learning in Business

INSTRUCTOR
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Grader: Soham Pravin Chinchalkar at schinch8@asu.edu.

COURSE DESCRIPTION
This course is an introduction to the practice of data mining and machine learning in business. We will study the fundamental principles and techniques of data mining, and we will examine real-world examples and data to place data-mining techniques in context, to develop data-analytic thinking. Students will complete this course with a broad set of practical data mining and predictive modeling skills based on "hands-on" experiences with a programming language, Python.

COURSE OBJECTIVES
At the end of this course, students should be able to:

1. Be able to approach business problems and envision opportunities data-analytically. Think carefully and systematically about how data-driven analytics can improve business performance and help make better-informed decisions for management, marketing, investment, etc.
2. Be able to interact competently on the topic of data mining and predictive modeling. Know the fundamental principles of data-mining that are the basis for predictive modeling, algorithms, and systems. Understand these well enough to interact with CIOs, data scientists, and consultants.
3. Have had hands-on experience in formulating problems based on data, using the various techniques discussed in class, and building and evaluating predictive models.

COURSE MATERIALS
Optional textbooks:
*Data Science for Business (**DSB**): What You Need to Know About Data Mining and Data-Analytic Thinking*, by Foster Provost and Tom Fawcett, O'Reilly Publishing (http://data-science-for-biz.com/).
*Introduction to Machine Learning with Python (**IMLP**): A Guide for Data Scientists*, by Adreas C. Muller & Sarah Guido, O'Reilly Publishing (https://www.oreilly.com/library/view/introduction-to-machine/9781449369880/).
Software:
Python: You will use *Python* to be able to versatile in handling multiple software/programing language to run various data mining models.

W. P. CAREY SCHOOL OF BUSINESS LEARNING GOALS
The W. P. Carey School of Business has established the following learning goals for its graduate students:

1. **Critical Thinking**
2. **Communication**
3. **Discipline Specific Knowledge**
4. **Ethical Leadership or Global Leadership**

WEEKLY SCHEDULE (Subject to change)

Week	Topics
Week 1 (Week of 3/17)	Course Overview
	Introduction to Data Mining and Machine Learning (IMLP Ch.1;DSB Ch.1)
	Introduction to Predictive Modeling (DSB Ch.2)
	Quiz #1 & Hands-on Exercise #1
Week 2 (Week of 3/24)	Supervised Segmentation: Tree Induction & Attribute Selection (IMLP Ch.2.3.5;DSB Ch.3)
	Discriminant Functions: Linear & Logistic Regressions (IMLP Ch.2.3.3;DSB Ch.4)
	Quiz #2 & Hands-on Exercise #2
Week 3 (Week of 3/31)	Discriminant Functions: Support Vector Machines and Neural Networks (IMLP 2.3.7-2.3.8;DSB Ch.4)
	Prediction via Evidence Combination: Naïve Bayes and Evidence Lift (IMLP 2.3.4;DSB Ch.9)
	Model Performance Analytics: Over-fitting and Holdout- and Cross-Validation (IMLP Ch.5.1;DSB Ch.5)
	Quiz #3 & Hands-on Exercise #3
Week 4 (Week of 4/7)	**Project Interim Presentation**
	Generalized Performance Measure: What is a Good Model? (IMLP Ch.5.3;DSB Ch.7)
	Visualizing Model Performance: Profit-, ROC-, AUC (DSB Ch.8) Hyper-parameter Tuning (IMLP Ch.5.2 & Ch.6)
	Quiz #4 & Hands-on Exercise #4
Week 5 (Week of 4/14)	Improving Model Performance: Random Forest, Ensemble Model, Bagging and Boosting (IMLP Ch.2.3.6)
	Similarity and Nearest Neighbors: Distance Functions and k-Nearest Neighbors (IMLP Ch.3;DSB Ch.6)
	Unsupervised Mining: Clustering Around Centroids and k-Means Clustering (DSB Ch.6)
	Quiz #5 & Hands-on Exercise #5
Week 6 (Week of 4/21)	Natural Language Processing: Bag of Words, Term Frequency, TF-IDF, N-Gram Sequences, Topic Models (IMLP Ch.7;DSB Ch.10)
	Other Data Science Techniques: Co-Occurrence, Profiling, Link Prediction (DSB Ch.12)
	Preparation of Project
Week 7 (Week of 4/28)	**Project Presentations**
Week 8 (Week of 5/5)	**Project Presentations (Optional)**

GRADING

Course grades will be based on the following criteria and weights:

Grading Criteria	Description	Weight
Hands-on Exercises (5 times)	• Gain experience using Python and applying machine learning techniques to address business-related questions. • You may use LLM applications (e.g., ChatGPT, Gemini) to assist you. However, you should be prepared to demonstrate mastery by answering follow-up questions about your code and making modifications during class. Your responses to these follow-up questions will affect your score positively or negatively. • Points deducted automatically at a rate of 10 percentage points per day for late submissions. • *Individual-effort* exercise.	30%
Online Quizzes (5 times)	• Approximately 10 multiple-choice and true/false questions per quiz, administered remotely. • Quizzes are *non-cumulative*, covering content after the previous quiz. • Quiz questions may vary per student. • Notes are permitted. • *Only your top 4 quiz scores will count.* • *Two attempts per quiz allowed.*	10%
Term Project	• *Group-effort* assignment requiring integration of course concepts. • *Interim presentation*: each group presents their business problem, data set, target variable, and feature characterization for feedback.	10%
	• *Final presentation*: evaluation based on analytical rigor, impact, and presentation effectiveness. Peer evaluation also included. • LLM applications can be used, but you should be prepared to demonstrate clear understanding and ability to modify and explain the model and outcomes during your presentation. Your performance in these areas will affect your score accordingly.	40%
Class Contributions	• *Meaningful participation* through questions, answers, or active discussion. • Merely attending class will NOT count as contribution.	10%
Total		**100%**

Grading Scale

Final course grades will be assigned on the basis of student performance using the guidelines below (ASU policy dictates that an instructor may choose to award plusses and minuses at his/her discretion). *The final grades may be adjusted based on the overall class performance as judged by the instructor.*

Percentage	Course Grade
97.0 – 100%	A+
92.0 – 96.9%	A
88.0 – 91.9%	A-
84.0 – 87.9%	B+
80.0 – 83.9%	B
75.0 – 79.9%	B-
70.0 – 74.9%	C+
65.0 – 69.9%	C
60.0 – 64.9%	D

Below 60%	E (Failure – no credit)

Final course grades will be posted on myASU within two weeks of the end of the course.

CLASSROOM BEHAVIOR
Please put smartphones away. Laptop use is fine for note-taking and hands-on exercises.

W. P. CAREY SCHOOL OF BUSINESS HONOR CODE
Unethical behavior by corporations has been linked with negative performance outcomes; the same is true of unethical student behavior. It is expected that students will neither participate in nor condone activities such as cheating or plagiarism. You are expected to do your own work on all individual exercises, quizzes, and exams. Students are encouraged to speak to other students about the issues, but do not share work or answers. Failure to follow this policy may result in zero points for both the receiver and provider (if involved). Also, the instructor may take any other action described in the current academic integrity policy. By placing their names on assignments, students are affirming that the contents are their original work. Consulting work done by students in this course in other platforms or in previous years is a violation of academic integrity. This policy will be vigorously enforced. Sharing work you do in this course with others, whether in the course with you or not, can tempt others to violate this academic integrity policy and can result in that student's failure in the course and dismissal from his/her program.
https://my.wpcarey.asu.edu/academic-integrity/upload/MBA-Honor-Code.pdf

Academic Integrity and Ethical Behavior
A student who engages in academic misconduct as outlined in ASU's academic integrity policy (http://provost.asu.edu/academicintegrity) while attending a graduate program will receive strict penalties. Those penalties ordinarily will range from a letter reduction in final course grade to expulsion from the program and School of Business. The penalty will be decided by the course faculty member and the Assistant Dean of Academic Affairs. All allegations of academic misconduct must be reported to program administrators. Any subsequent act of academic misconduct, regardless of severity, will result in dismissal from the program and the School of Business.

Attendance Policy
Attendance and participation in class activities is an essential part of the learning process, and students are expected to attend class regularly. Some absences are, however, unavoidable. Excused absences for classes will be given without penalty to the grade in the case of (1) a university-sanctioned event [ACD 304-02]; (2) religious holidays [ACD 304-04; a list can be found here https://eoss.asu.edu/cora/holidays]; (3) work performed in the line-of-duty according [SSM 201-18]; and (4) illness, quarantine or self-isolation related to illness as documented by a health professional. Anticipated absences for university-sanctioned events, religious holidays, or line-of-duty activity should be communicated to the instructor by via email at least two weeks before the expected absence.

Absences for illness, quarantine or self-isolation related to illness should be documented by a health professional and communicated to the instructor as soon as possible by email. Excused absences do not relieve students from responsibility for any part of the course work required during the period of absence. Faculty will provide accommodations that may include participation in classes remotely, access to recordings of class activities, and make-up work.

If there is a disagreement as to whether an absence should be accommodated, the instructor and student should contact the academic unit chair immediately for resolution. In case you cannot attend class in person as a result of illness or possible exposure to infectious disease, you may request a digital recording of the class sessions you are unable to attend as well as make-up work from the instructor. Reach out to me via email and we can work out the details. Alternatively, students who are unable to attend due to sickness or exposure to infectious disease may participate remotely via ASU Sync. Zoom links and passcodes for each section of the course are listed at the top of the Canvas home page.

THREATENING BEHAVIOR POLICY:
The university takes threatening behavior very seriously and these situations will be handled in accordance with the Student Services Manual, SSM 104-02.
http://www.asu.edu/aad/manuals/ssm/ssm104-02.html

DISABILITY ACCOMMODATIONS:
If you need an accommodation for a disability, you must register with the Disability Resource Center (DRC) at: https://eoss.asu.edu/drc

Copyrighted Material
Unless otherwise stated by the instructor, all viewgraphs, lecture notes, data files, publications, exam/quiz/homework answer keys, and all other materials provided by the instructor are copyrighted materials and are provided for sole use by the students as study aids. These materials, as well as notes taken by students during the course, are not to be sold, copied, posted on a public network, or otherwise distributed.

Title IX, Sexual Harassment & Violence
Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish discuss any concerns confidentially and privately.

Information contained within this syllabus (except grading and absence policies) is subject to change.