CHICAGO BOOTH

The University of Chicago Booth School of Business

Business 41204 – Machine Learning

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Overview

This course aims to provide a high-level overview of machine learning and its applications in the business world. The goal of the course is to offer a broad, relatively non-technical introduction to key ideas from machine learning without digging too far into the mathematical minutiae. We hope the course will be accessible to students with an understanding of basic statistical concepts and mathematics but no deeper training. While one cannot do machine learning without coding, the course is not about coding and will not require any coding expertise. Overall, we hope students will leave the course able to have informed conversations about machine learning, understanding key conceptual ideas, and having a better idea of realistic opportunities for the use of machine learning in business as well as understanding potential challenges.

We will cover the three basic learning paradigms: (i) supervised learning, (ii) unsupervised learning, and (iii) reinforcement learning. We will illustrate the paradigms through business relevant applications that may include detecting spam in email, click-through rate prediction in online advertisement, image classification, face recognition, sentiment analysis, churn prediction, algorithmic trading, customer segmentation, recommender systems, graph and time series mining, and anomaly detection. Through the applications, we will highlight important concepts and practical considerations. After covering basic learning methods, we will explore additional topics such as large language models, causal machine learning, and ethical considerations such as privacy and fairness.

Prerequisites

BUS 41000 or 41100 (or equivalent). Prerequisite material includes fundamentals of probability and statistics as taught in BUS 41000 and 41100. We will assume that students are familiar with descriptive statistics (e.g. sample mean, standard deviation, covariance/correlation), random variables, basic probability calculations, normal distributions, confidence and prediction intervals, sampling distributions, hypothesis testing, and the basics of linear regression.

Students with previous background in statistics or data science from work or courses outside of Booth are welcome to take the class. It is the student's responsibility to self-assess having sufficient background and to withdraw quickly if it turns out that the student's background is insufficient.

Importantly, this course does not cover basic statistics material that is assumed for other courses at Booth. Such classes may not accept Machine Learning as a replacement for 41000 or 41100 prerequisites.

Software

The use of software is an important element of the machine learning toolkit. We will use Python for in-class examples and on problem sets. We will be running Python from notebooks within the Google Colab environment. Students will not need to download or install any software to participate in the class or complete any assigned tasks.

It is important to note that software is tangential to the main point of the class – understanding the application of basic machine learning concepts – though necessary to actual application of machine learning. As such, students will NOT be examined on how to use software or otherwise be required to obtain substantial coding skills. Students will be expected to be able to interpret results provided by software, have a high-level understanding of how to apply machine learning tools, and be able to think critically about applications of machine learning.

AI Tools

We see AI tools (e.g. ChatGPT, Claude) as potentially productivity enhancing, and believe a machine learning course is a great environment to experiment with such tools. There will likely be problem sets that require the use of a large language model based AI tool for their completion. Outside of this, the use of AI tools is not mandatory but is actively encouraged. As a learning tool for all of us (especially us as your instructors), we

would ask that you document where and how you use any AI tools in completing your coursework.

Text and Class Notes

The lecture notes (available on Canvas) cover everything you need to know for this course.

There is no required textbook. The book Introduction to Statistical Learning with Applications in Python by James, Witten, Hastie, Tibshirani, and Taylor (ISL) is a relatively approachable text that covers supervised and unsupervised learning methods. It is available as a free .pdf download. We recommend ISL for students who want to dig a bit deeper into a textbook treatment of the supervised and unsupervised learning topics we cover.

Homework and Exams

Course grades will be based on group problem sets and a final examination which will count for 40% and 60%, respectively, of the final grade. Grades will be assigned based on a curve.

Details:

Problem Sets – Problem sets will be assigned throughout the quarter. These problem sets may be solved in groups of 1-4 students. The problems are meant to provide some introduction to practical application machine learning methods, review concepts from the course, and provide a mechanism to think about important concepts from the course. Only one write-up should be submitted per group.

Final – The final will be a written exam. The exam will be open notes and students may use a computer. The exam will be comprehensive.

Requests for regrading – All regrade requests must be made within two days of the return of the exam. Regrade requests should be made in writing with a clear statement of the basis for the request. Clerical errors will be corrected with no risk to the student. Other regrade requests will result in regrading of the **entire** exam and may result in downward as well as upward revisions of grade.

Booth Honor Code – The final is meant to be individual work. You should not consult with other students or any other person in completing your exams. Each student shall

sign the following pledge on each exam: ”I pledge my Honor that I have not violated the Chicago Booth Honor Code during this examination.”

Accommodations for Disabilities

The University of Chicago is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or think you may have a disability) and, as a result, need a reasonable accommodation to participate in class, complete course requirements, or benefit from the University's programs or services, please contact Student Disability Services as soon as possible. To receive a reasonable accommodation, you must be appropriately registered with Student Disability Services. Please contact the office at 773-702- 6000/TTY 773-795-1186 or disabilities@uchicago.edu, or visit the website at disabilities.uchicago.edu. Student Disability Services is located at 5501 S. Ellis Avenue.